JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

Average Make: 11,383 Cubic Feet per Ton.

A LITTLE later than their predecessors, but not so much, considering the magnitude of the work involved, that complaint need be made, the Board of Trade have issued their returns relating to the working of the statutory gas companies during 1910, and to the local authority concerns during the year ending March last. The tale is a good one in every direction—technically and commercially; and a few figures will show that the industry has every reason for gratification over the progress recorded. Through companies ascending from the non-statutory to the statutory plane, there are in the 511 concerns making returns ten additional ones; and through transfers, the number of local authority undertakings making returns (298) is five more. The capital employed was £134,683,695—an increase on the preceding year of £2,560,411. But, this increase notwithstanding, the ratio of capital to gas sold (including concerns of all types and sizes) has been reduced, by between £7 and £8, to £736 per million cubic feet of gas sold. That is the correct trend.

Taking, in the next place, the manufacturing features of the accounts, it is remarked that the quantity of coal carbonized was 15,397,783 tons, which is an increase of 172,463 tons. But it must be remembered that the fifteen additional companies brought into account will have contributed to this increase. It is necessary to dip into the gas make to ascertain the real technical improvement that the returns exhibit. The average production per ton of coal is at a figure that—considering the returns take in workings that, judged by the standard of to-day, may be classified as excellent and indifferent—was thought to be impossible but a few years ago. The total quantity of gas made was 198,733,354,000 cubic feet—an increase of 5,185,960,000 cubic feet. Of the total, however, 23,456,162,000 cubic feet were water gas; and, deducting this, we have a total coal gas production amounting to 175,277,192,000 cubic feet, which averages out to no less than 11,383 cubic feet per ton of coal carbonized. This is a figure that speaks volumes. In the preceding year, the make averaged 11,160 cubic feet per ton; so that the year showed an average enhancement in the make of 223 cubic feet. If the production per ton had continued during the year at the same level as in the year before, an addition of 308,058 tons to the 15,397,783 tons of coal carbonized would have been required. Considering the different grades of gas-works both in magnitude and equipment over which these figures are spread, we must regard this statement as to average production to be *the* feature of these very agreeable returns. We have only to go back five years to find an average production 512 cubic feet per ton below the figures of the present returns. What this means financially, spread over the statutorily authorized gas industry, is something really substantial.

It is an extremely healthy position; and commercially the business of the year dealt with by the returns is equally so. The revenue of all the statutory undertakings amounted to £31,276,196, which is an increase on the preceding year of £926,154. The expenditure totalled to £23,211,379, which was an increase of £402,736. So that the statutory gas industry's revenue account was better in gross profit by upwards of half-a-million sterling. The business done expanded, by 5,146,985,000 cubic feet, to 182,833,928,000 cubic feet. The gas distribution system of the country penetrated an additional 892 miles; making a total mileage of 36,122. A further 253,783 consumers opened up business relations with the industry; making the total number (of course, still excluding the customers of the non-statutory concerns) of consumers 6,417,849. The number of public lamps supplied by the 809 statutory undertakings was 720,785; representing an increase of 7882 on the year. We recommend these official figures, so richly indicative of general progress, to the consideration alike of friends and rivals of the gas industry.

Gas Measures under Review.

WITH the beginning of the year, thoughts turn to the parliamentary prospects in relation to the gas industry. In regard to the privately promoted Gas Bills, a fairly complete idea as to their characteristics can be obtained by a careful survey clause by clause of each one. Concerning measures promoted from outside the industry that may bear upon its interests, it is, however, impossible to speak, as, generally, they do not even cast their shadows before them until their introduction in the House itself. At the moment, there is only one measure of external origin in which the industry is directly interested, and that is the wiring, fittings, and finance Bill, appearing under the unpretentious title of the "Electric Lighting Bill," but which, promoted by the Incorporated Municipal Electrical Association, is intended to confer magnificent and unprecedented statutory powers upon local authorities trading in electricity. We called attention to this Bill in the "JOURNAL" for Dec. 12 (pp. 740, 748); and, if it proceeds, it will have to be closely watched, seeing that the ability to speculate which municipal electricity suppliers already possess would, by it, be increased many fold.

In regard to the privately promoted gas measures, we are looking to a session of varied interest. Session by session, new phases of enactment are linked-up with or suppress the old in connection with gas supply; and in the measures as they now come before us, we can see how irresistible are the influences that compel the industry to take those roads of development that are the most natural and the least cumbered with difficulty. Though in the coming session there will be more interest than has been the case in recent years, the number of the Gas Bills will not be great. The Bills introduced by existing limited or new Gas Companies number seven in all; there are fifteen measures promoted by statutory Companies (including the joint Benefit Funds Bill and the joint Standard Burner Bill); and there are nine Bills, devoted wholly or partly to gas, promoted by local authorities. In the aggregate, therefore, there will be 31 Bills. Added to these will be a couple of Scotch measures in which gas is concerned, and which will be dealt with under the Private Legislation Procedure (Scotland) Act. In regard to Provisional Orders, it is not anticipated that more than twelve or thirteen will be proceeded with. Thus from the point of view of numbers, it will not be a fat session, whatever it may be otherwise.

The Bills surveyed this week are those of the limited and new companies; and the feature that protrudes chiefly upon notice is the extension of areas of the limited companies, and the absorption of smaller undertakings or their amalgamation. One of the Bills is especially noticeable. It is that of the Bordon and District Gas Company. The concern under this style appears to be the crowning point in a sharply made history. Since the year 1908, there has been witnessed the birth, separately, of the Woolmer and District Gas Company, the East Hants Gas Company, the Liphook Gas Company, and the Liss Gas Company. Within the same space of time, these companies have undergone fusion; and now it is proposed to pass them through the parliamentary mill, and bring them out under the appellation of the Bordon and District Gas Company, with full statutory powers. There is nothing to be said against this proceeding except that, looked at technically, the flotation of these companies as separate units must have meant a much larger capital expenditure than if they had been brought out in the original instance as a single Company, as now proposed. We cannot for the life of us understand, without an explanation that we should require to be very detailed indeed, how a capital expenditure of £28,310 has already been incurred. If this amount of

capital expenditure is not adequately represented by the property and the business of the undertakings, it will be for Parliament to say what shall be done in regard to the capital powers now sought. It will be interesting to learn, when the Bill is before Parliament, whether the East Hants Company have only a present annual output of between 7 and 8 million cubic feet of gas; or whether it is more. Also whether that, or some other, total output, includes the supply in bulk of the Liphook and Liss Companies. It is difficult to find any exact information about these concerns; and therefore we do suggest that, in the interests of the public and of the good name of the gas industry, Parliament should very definitely ascertain—by the test commonly applied in the gas industry—the ratio of capital to millions of output, in order to judge whether for this class of concern there has been, from whatever cause, over-capitalization. We have no definite figures upon which to work; but such as we have induce these suggestions. It is also observed that a "standard" price is mentioned in the Bill; but we do not see that, under the new conditions, dividends are mentioned to which the capital is to be entitled, nor is any provision made for a sliding-scale. Notwithstanding, in the clause, with the side heading "Dividends on "Different Classes of Stock or Shares to be Paid Proportionately," we notice that the prescribed "maximum" rate of dividend is referred to. Whether this means as prescribed in the Order under which the East Hants Company are working, we do not know. A "standard" price and a "maximum" dividend seem, however, to be at variance. But, under the new circumstances, it would surely be advantageous to have the powers in respect of dividend set forth in the present measure.

Among miscellaneous interesting points in the class of measures under notice this week, it is seen that, in the Herne Bay Gas Company's Bill, which is mainly for new works powers, there is a suggested modification of section 7 of the Gas-Works Clauses Act, 1847, which seems to hint that the Worthing tunnel case has been present in the mind of the drafters. The terms of the proposed modification are set out in the review elsewhere. In the case of two or three companies, there are proposals for extinguishing the rights of supply of undertakings in certain areas in which these rights have not been exercised. In five out of the seven Bills—Bawtry and District, Brodsworth, Fleetwood, Herne Bay, and Woking—there are stand-by clauses relating to both gas and electricity. Three companies are going to try to secure the right, in connection with the prepayment meter clause, to charge an excess of 8d. for meters without fittings. Unless there is agreement, the proposals of the Bawtry and District Gas Company and the Bawtry and Tickhill Water and Gas Company look like clashing over their applications for statutory powers so far as gas supply is concerned. The Fleetwood Gas Company, it is interesting to note, are taking power to introduce a scheme for profit-sharing with their employees.

Thinking and Acting Imperially.

To all those gas undertakings that have not yet seen fit to accord pecuniary support to the British Commercial Gas Association, may be heartily commended for consideration a letter published in our "Correspondence" columns from the Metropolitan Gas Company of Melbourne, as well as the considerations therein advanced which have led to a very practical act on their part. The Company are outside the orbit of the immediate work of the new Association; and their conditions are somewhat different from those obtaining in this country. Nevertheless, the Directors take the broad view that some of the benefit of the work that the Association are launching out upon will filter through even to far-off Australia; and therefore they desire to contribute £100 in each of the next three years in aid of the work, and thereafter will further consider the matter.

This is practical sympathy, appreciation, and encouragement rolled into one act; and it is to be hoped that the example of our Australian friends so distantly situated from the immediate activities of the Association, will influence material support from many more of the gas undertakings at home who, so far, have been altogether passive in the matter. If the Melbourne Gas Company believe that the work of the Association contains a measure of advantage for them, how much more will the work contain direct advantage for undertakings at home! In their letter, the Directors say they are of opinion that "the publication of information having for its object the education of the community in "matters pertaining to the use of gas, both from the hygienic "and economical points of view, and the refutation of many "misstatements circulated by its opponents, must in the "long-run prove of considerable advantage to the gas industry wherever situated." That is also our belief. The act of our Australian friends in this matter will be greatly valued by the contributing section of the home gas undertakings; and it will tighten the bonds that already connect the Australian gas concerns with the gas industry of this country. The view that the Directors of the Company have taken (on the initiative of their Engineer, Mr. P. C. Holmes Hunt) is, to use political terms, the Imperial one, and not that of the Little Englander.

The Imposition on Hampstead Ratepayers.

THE Hampstead Councillors who were for secrecy over the scandalous results of the public-lamp conversion, probably because they themselves are involved in obvious maladministration, must feel exceedingly uneasy over the storm they have raised about their heads. The ratepayers have the best of causes for indignation, seeing that not only was the cost of the conversion to electric lighting £10,000 more than was estimated, but the £25,000 odd have been expended in producing something worse than the ratepayers previously had in the streets in the way of public lamps, and far worse than the Gaslight and Coke Company offered, at less cost, under a new scheme of lighting with inverted gas-burners. The ratepayers are convinced that they have been imposed upon by men who, in effect, have had to confess that they have been led along abjectly ignorant of their destination in this matter, and manifestly not caring much as to what was going on about them. One result is that their arraignment at the bar of public opinion is being conducted, in the columns of the local newspapers, in a manner that indicates the acute and general resentment that is felt.

There is more for the councillors concerned to answer for in connection with the financial management of this business than was at first apparent; and this is seen, in very striking manner, by the letters that are reproduced in our news columns to-day from a Hampstead contemporary. On the ground of mismanagement, on the ground of fictitious and fancy estimates, and on other grounds, it is suggested by one correspondent that it is essential the whole matter should be investigated by the Local Government Board. Beyond these matters, there is another serious charge; and it is that the ratepayers are not getting what was bargained for from the Electricity Department in the way of light. The Gaslight and Coke Company competed with the Electricity Department on the basis of a certain candle power being afforded by the electric lamps; but it is now asserted by competent expert opinions and tests, and by general observation, that the basis has been altogether violated by the lower illuminating power actually produced by the electric lamps. This is a strongly attested allegation that may make the ratepayers generally think still more deeply over the matter. If the Gas Company had been the contractors for the public lighting, the Council would have seen that the terms of the contract were fulfilled to the very letter. As the Council are their own contractors in this matter, they can depart as much as they choose from the original promise, without calling themselves to account.

However, it appears quite clear that the ratepayers have been "done" in all directions over this contract; and they realize it. As there is only one Court of Appeal for them from the Council, and that the Local Government Board, it is hoped that the central authority will listen to the appeal, when made, for an inquiry. Meantime, further piquancy is being added to the situation by a suggestion of the Lighting Committee that the Chief Electrical Engineer (Mr. G. H. Cottam), who was asked to resign, should do so six months hence, and that a superannuation allowance should be granted him. Mr. Cottam, in the hours of his tribulation, must feel pleasure in the fact that he does not stand altogether friendless, after all that has happened, in the municipal circles of Hampstead. Even if he does not get the superannuation allowance that his friends are anxious to secure for him, the fact that it was proposed must always be to him a happy recollection. Should, however, the ratepayers protest sufficiently strongly to prevent the allowance being granted, he must merely put this down to a singular want of appreciation of the crowning event in his career as Electrical Engineer of Hampstead.

Recantation by "Engineering Correspondent."

THE "Engineering Correspondent" of the "Daily Tele-"graph" has shown that he was open to conviction as to the errors committed in the article that appeared in the columns of our morning contemporary, from his pen, on Oct. 7 last, which provoked the controversy that has been proceeding in our columns. He has largely retracted, in an article published yesterday, and which in justice to him we reproduce elsewhere, the original statements that were so injurious and unjust to the gas industry. He now freely acknowledges the injustice; and this we are not sorry he refrained from doing until he had thoroughly satisfied himself as to the misrepresentation to which he unwittingly gave circulation through reliance on untrustworthy sources—a reliance that was one of the most regrettable incidents about the affair. The article was, indeed, a remarkably rapid translation from a position of independence and an unbiassed presentment of the commercial interests of two large industries to what was acute partizanship. But the retracing of steps to the *status quo*, in view of the positive character of the statements published in our morning contemporary on Oct. 7, has been a much slower process. There is some reserve still shown by "Engineering Correspondent" over various matters; but we are glad to see that the reserve is now as much directed to electricity as to gas. We hope, however, further investigation will deepen his conviction that those to whom he lent a ready ear in October are even more unworthy of credence than possibly he thinks them at the present moment. There are points in the article published elsewhere in our columns to-day that invite criticism; but its general tenor is such that we will refrain. Of this we may rest assured, that there will be, in future, a closer investigation of matters affecting the interests of the gas industry before those interests are assailed and defamed in the manner against which the "JOURNAL" made, and defended, strong protest. As to the letters of "Engineering "Correspondent" to the "JOURNAL," those are another matter altogether, and we shall deal with them in an article next week.

Gas Profits and the Local Government Board.

NOTWITHSTANDING the intervention of the Local Government Board, we hope sincerely, in the cause of the ending or mending of an objectionable and much-abused phase of municipal trading, that the Salford outside authorities will not relinquish one jot of the advantage they secured from Parliament in 1909, in relation to the question of the appropriation of gas profits, and their application to the local rates. Up to the present time, the Corporation of Eccles and the District Councils of Swinton and Pendlebury and Worsley have occupied a strong position; and the last move made by them in the promotion of a Bill with the view of putting the seal on their gain of 1909 was a piece of strategy of the best making. The tempting offer made by Salford, that the outer authorities should share in the plunder derived from the gas consumers, has been rejected with the dignity that has characterized all through the attitude of the Corporation of Eccles and their associates in this matter. To have fallen under the temptation would have been altogether repugnant to the 1909 and subsequent decisions of Parliament, and would have been opposed to the very platforms upon which the outer authorities stood in preferring their claim in 1909 when Parliament were so sympathetically and favourably inclined to them. We are not at all sure that, even if the Salford Corporation succeeded in buying over the outside authorities, in order to save a larger amount of gas profits for the borough rates than Parliament is prepared to give, that Parliament would endorse the arrangement, when it came before them, *viâ* the Local Government Board, in the Provisional Order.

The offer of Salford to buy the outside authorities by profit participation was only made at the eleventh hour, when Salford saw that their neighbours had locked them fairly securely in a position from which there was no easy escape. And we are disposed to think, if, as we hope they will, the Bills come before Parliament (should the 1909 position be incapable of establishment otherwise), this offer will not improve the position of the Salford Corporation. But the Local Government Board are apparently trying to provide means of escape for the Council, in connection with their application to proceed by way of Provisional Order, which, of course, means the withdrawal of their own Bill, leaving that of the outside authorities before Parliament. In relation to the latter, the Board consider that the inquiry into the Provisional Order will afford an opportunity for the discussion of the questions at issue between the Corporation and the outside authorities. Now it may be candidly said that we do not like the terms of the communication that the Board have addressed to the authorities concerned, and for two reasons. It seems to suggest a compromise, which could only mean that the outside authorities would have to concede something representing a departure from the situation created in 1909. The Board's communication also appears to hold out a threat to (seeing the Corporation are now proceeding by Provisional Order) the outside authorities. The Board write: "If these Bills were proceeded with, a "costly contest in Parliament would seem to be inevitable; "and having regard to the provision of section 10 of the "Borough Funds Act, 1872, and to the fact that the objects "aimed at are attainable by Provisional Order, the Board "would feel considerable difficulty in sanctioning the pro-"motion of either Bill under the Act mentioned."

Section 10 of the 1872 Act states: "The provisions of "this Act shall not extend to applications for any Bill in "Parliament for any object which would, *for the time being*, "be attainable by Provisional Order." We have here in the question at issue between Salford and the outer authorities a principle involved—a principle of immense importance to gas and electricity consumers throughout the whole country, and a principle that Parliament has begun to deal with. This being so, we are not altogether sure that the principle is a matter that it is quite proper and fit to deal with in a Provisional Order. It is essentially a subject for Parliament; and it is very undesirable that the Local Government Board should interpose themselves between local authorities and Parliament when the former have resolved to appeal to the latter on a question that already has been partly considered by Parliament, and a question that is purely one of principle. The hint thrown out by the Board, as to the difficulty they would feel in giving their sanction to the promotion of either of the Bills, appears to us to be, if effect were given to it, very much like pushing the power conferred on the Board under the 1872 Act to the extreme limit, if not a little beyond it. The parliamentary authorities have already recognized that the large powers possessed by the Local Government Board in regard to financial matters are antagonistic to the supervision by Parliament of the conditions under which municipal trading concerns are conducted. The Local Government Board were told this pretty plainly by the Unopposed Bills Committee last session when dealing with the Milford Haven Gas Order; but they are loth to lose one scrap of their power in this regard. It is hoped that, if the Local Government Board decline their sanction in a case in which it is right and proper that a matter of principle should be submitted to Parliament, the question will be raised in Parliament, and a way be found for getting a straight decision from both Houses on the main subject. There ought to be no compromise outside the terms of 1909. However, if the Local Government Board persist in their action, it may only hasten Parliament in definitely dealing with the whole subject.

An Irish Gas Arbitration.

Though involving a comparatively small sum—as gas undertakings go—there were points of interest about the Mallow Gas-Works purchase arbitration, the proceedings in which (occupying four days) were reported at length in the "JOURNAL" last month. The sole Arbitrator was Mr. C. C. Hutchinson, who has now issued his award. The undertaking was an unstatutory one; but in 1910 the Company promoted a Bill for the purpose of securing parliamentary powers, and the local Council came forward with another to give them authority to compulsorily acquire the concern. The latter Bill was passed; hence the arbitration proceedings. Mr. R. B. Anderson, who had done much for the undertaking in the capacity of Engineer and Secretary, had an agreement with the Company, under which he received a small salary, and a moiety of all profits earned in excess of what was necessary to pay 5 per cent. on the ordinary shares; and the manner in which this agreement ought to be dealt with was fully argued during the hearing. Then the Company had a gas-fittings business and a coal business; and various suggestions were made as to the proper method of treating these in arriving

at the value of the undertaking. In giving evidence for the Company, Mr. Frank Jones submitted a valuation based on 22 years' purchase; and to the resultant figure he added £1000 for surplus works—leaving open the question of the allowance to be made for compulsory purchase. Mr. Henry Woodall took as his basis 25 years, and also added the same amount for surplus works, and 10 per cent. for compulsory purchase. The former applied his 22 years to the coal and fittings businesses also; but the latter allowed five years' purchase of the profits on these two branches. On behalf of the Council, Mr. William Newbigging (with whom Mr. John Lyne expressed agreement) employed a multiplier of 16¾ years; and he allowed two years' purchase of the fittings profits, and nothing for the coal business, which he did not regard as part of the undertaking acquired. As to the actual figures, Mr. Jones's valuation (without dealing with the question of compulsory purchase, or reference to future saving in respect of Mr. Anderson) was £11,824, and Mr. Woodall's £11,603; while Mr. Newbigging's figure was about £4700. The award of the Arbitrator fixes the sum to be paid at £7359.

Smoke Abatement Exhibition.

It was lately suggested in these columns that, if there was any indisposition on the part ef the manufacturers of gas-heating appliances to take part individually in the Smoke Abatement Exhibition at the Agricultural Hall from March 25 to April 4 that perhaps a collective exhibit conld be arranged. Whether any decision has been arrived at in regard to this matter has not yet been announced. It is understood that a large block of minimum area 1280 feet super. has been allotted to the electrical exhibit, which will demonstrate the uses of electricity for all purposes, and, in addition, individual electrical firms will have stands. In connection with the exhibition, there will be conferences and lectures.

Wires and Fires.

Time improves knowledge. Quite lately, succeeding the Carlton Hotel fire, the Buildings Committee of the London County Council were considering the question of having all electric wires in hotels and other places where sleeping accommodation for the public is provided enclosed in steel casing. The electrical industry was at once up in arms against the proposal, including some representatives who had been hostile to any reduction of the stringency of the rules of the Institution of Electrical Engineers, and who are against the free use of flexible, in both respects on the ground that safety should be of paramount importance. As to the attitude of the fire offices, they and electricity suppliers, of course, view questions of this order somewhat differently; the incidence of the effects of conflagrations upon the former being more direct than in the case of the latter. The Phœnix Company, among other fire offices, have had heavy compensation to pay through electric fires. They have issued a revised set of rules; and they now inform all whom it may concern that, in the system which they approve, "the wiring throughout should be enclosed in substantial iron or steel barrel, with screwed connections. All apparatus and fittings . . . should be enclosed in iron boxes, into which the barrel should screw." Thus the Phœnix Office endorse the views of the Buildings Committee of the London County Council. It is also found that electric wire pipes and fittings placed in the open and exposed to damp should be galvanized and made water-tight as well as blocked from damp brick walls. Electric lifts which have been strongly suspect lately have received special attention. Premier position is given, among the "Useful Facts to be Remembered," to the truth that "Electricity can readily change to fire." So the tenants of 126, Jermyn Street, Haymarket, learned last Thursday morning. An electric wire fused on the premises, and an outbreak of fire resulted. So great was the heat, remarks the truthful reporter, that thick pipes were melted, and smoke soon filled the upper part of the house. Two girls had to be rescued from the top floor by a fire-escape.

Coke as a Domestic Fuel.

As the publication of the last of the series of Cantor lectures by Professor Vivian B. Lewes, and our comments of last week, showed, the climax of his interesting examination of current carbonization problems was found in his suggestion that gas companies should improve the quality of their coke by leaving more volatile constitutents in it, and in his view as to how this could be accomplished with commercial gain. It was pointed out in our comments that there were no particular technical difficulties in what was proposed; the whole thing really resolving itself into a question of the relative commercial advantage of present and suggested procedure, in which the attitude of the public in relation to improved coke is an important consideration. We do not for one moment suppose that Professor Lewes's criticism of the first in the line of secondary products in gas-works will have done anything in the way of depreciating coke in the eyes of the public for domestic purposes. The general public seems to have largely made up its mind on the subject long since—going back even to the days of comparatively low temperature carbonization in gas works, and to subsequent coalite efforts. Naturally, there are a few householders who would at once appreciate such a coke as Professor Lewes suggests; but the few would not be sufficient to cause a revolution in gas-works carbonization practice. One such householder is Mr. Kenneth R. Swan; and he has written to "The Times" giving whole-hearted support to Professor Lewes, and showing a firm belief in that extensive, but at present purely hypothetical, market that the improved coke would command. He assures gas undertakings that they would "in a comparatively short time be reaping ample compensation for any diminution in their product of gas per ton of coal." But Mr. Swan goes farther than did Professor Lewes. He thinks it probable that, to obtain the improved coke, a better quality of coal would be required; and there, apparently unconsciously, he introduces another factor that would assist in somewhat seriously affecting the proposition commercially—more especially if there is to be "a careful selection" of coal. He finds the ash and sulphur in the best coke he has been able to obtain serious objections; and he believes that both objections can be "removed" by the "careful selection" that he advocates. We are afraid, if he gives a little more consideration to the incombustible and the chemical properties of coal, he will see that the removal of the "objections" is not so easy of attainment, apart from the question of the cost of selected coal.

A Question of Liability.

Probably most people who study the proceedings at last week's meeting of the Oxford City Council will be inclined to congratulate all parties concerned on the settlement which has been effected in connection with a matter involving a question of legal liability. The Council, however, or some members, found plenty to discuss before deciding to ratify the agreement which had been come to by a Committee on their behalf. From what transpired at the meeting, it appears that there was a collision last October of a motor-car with a lamp-post standing in the centre of a street. At the time of the occurrence (about 7.30 in the evening), it was, of course, dark; and the lamp was unlighted. Under these circumstances, a claim for damages was made by the owner of the car; and this the Chairman of the Gas Company (Alderman Ansell) and the City Solicitor settled, for a sum of £410 and costs. The amount was paid by the Gas Company's cheque; and the debate in the Council arose on a recommendation of the Parliamentary Committee that of this amount £200 should be repaid to the Gas Company by the Corporation. The lamp in question was proved to have been duly lit up some time previous to the collision; but there was no doubt it was subsequently out—very probably through a defect, though apparently it was suggested in some quarter that it had been put out by members of the University. However this may be, certain councillors held that the Company were liable for it not being kept alight, which fact was the cause of the accident. On the other hand, it was pointed out that any action would have lain against the Corporation, as the owners of the lamp standard, who were responsible for placing it where it was, in the centre of the roadway, and who "must so mark it that the wayfaring man, ignorant as he might be, could not run into it." That the Corporation themselves have ultimately recognized the unsuitability of the position in which the lamp had been for over twenty years, seems clear from the fact that it has since been removed. It will be noticed that in the course of the discussion one of the speakers said he could not help thinking it was extremely unfortunate for the Parliamentary Committee (who had the matter in hand) that three of the members should be Directors of the Gas Company. These gentlemen, however, acted very properly in absenting themselves while the question of their liability was

being discussed; and so there can be no reason for the remark made—for the "moral influence" hinted at cannot fairly be laid at their door. The Town Clerk put the matter well, when he answered that "they could not eliminate from the Corporation, and from all the Committees of the Council, every member who had any interest in anything at all in the City of Oxford." Why should they wish to do so? It may be assumed that the Directors of local commercial concerns are good business men; and that is just the quality that is also most desirable in a city councillor.

Gas Profits and Borrowings.

Municipal electrical friends have found Mr. H. Ross Hooper, of the Local Government Board, too keen a critic of their finance for their liking; but perhaps they will derive some consolation from the knowledge that he shows no undue preferences or otherwise. An application by the Newcastle-under-Lyme Corporation for additional borrowing powers for their gas undertaking has lead to some severe criticism by him of an order that is tantamount to censure; and no denial of the justness or soundness of the criticism can be advanced. The only defence that could be made at the inquiry was that what has been done by the present administrators of the gas undertaking was a bad custom of their predecessors which has been continued, for no stronger reason than that there was the precedent for it. What has happened is that there are overdrafts on account of the gas undertaking, while year by year profits are transferred to the relief of the rates—in the last ten years to the amount of £16,700, while £719 has been employed to clear off an overdraft on the electricity supply works. Now the Corporation are asking for a loan for, among other purposes, wiping off these overdrafts. The loan, of course, will be added to the obligations the gas consumers are called upon to discharge; whereas, if, as Mr. Hooper said, the Corporation had not devoted the profits to the relief of the rates, there would have been no necessity to borrow to wipe off the overdrafts, and the Corporation might have created a gas reserve or depreciation fund. That is sound advice; and the Council know it. But they have been following custom; and the burden of it will fall upon the gas consumers, who have already supplied more profits than the real needs of the undertaking require. Perhaps now that Mr. Hooper has had this direct talk with the representatives of the Council, there will be a change in the financial policy, and greater consideration given to the just treatment of the gas consumers.

More Coal Figures.

There are some big figures to be found in the latest compilation of the annual parliamentary paper known as the "Coal Tables;" and, so far as these may be considered as of general interest, they are summarized on another page of to-day's "JOURNAL." It was only a week or two ago that the output of coal during 1910 in the United Kingdom was published—the amount being stated at nearly 264½ million tons; and we learn from the further particulars now available that this quantity constitutes just over one-quarter of the total known coal production of the world (exclusive of brown coal or lignite) for the twelve months—namely, about 1035 million tons. Large as was this country's proportion of the whole production, the output of the United States exceeded it by nearly 70 per cent., with a provisional figure of 448 million tons. When looked at in another way, however, the figures assume a different aspect; for, in comparison with the population, the amount of coal produced in this country is greater than that of the United States. That is to say, the figure for the United Kingdom is nearly 6 tons per head, as against less than 5 tons for the United States. In 1910, the aggregate output of the five principal coal-producing countries—the United States, the United Kingdom, Germany, France, and Belgium—was 923 million tons, or an increase of 42 million tons on the output of 1909, and of 27 million tons on that of 1907—which was the previous highest total. In fact, each individual case last year constituted a record, with the exception of the United Kingdom, whose output for 1910 fell short of that of 1907 by nearly 3½ million tons. In the matter of consumption of coal per head of the population, the United States comes first with 4·72 tons, though the 4·01 tons of the United Kingdom is not so very far behind. The annual consumption of coal in this country in the production of pig iron is about 20 million tons, in the manufacture of gas over 15 million tons, and for locomotive purposes nearly 12½ million tons. With regard to prices, last year does not appear to have provided any startling changes. In the case of the United Kingdom, there was a rise of 1½d. per ton, to 8s. 2½d.; and in other instances, also, there was only a slight variation one way or the other. The average value of coal per ton has, however, increased considerably in each of the European countries already named during the last twenty-five years—the average for each quinquennial period showing an advance, until in 1906-10 it reached 8s. 3½d. in the United Kingdom, 9s. 10d. in Germany, and 12s. 6½d. in Belgium, while in France it averaged 12s. 3¾d. per ton in the four years ended 1909. For the period 1906-10, the average price in the United States has been 5s. 10d. per ton.

PERSONAL.

Sir KENNETH CROSSLEY, Bart., Chairman of Messrs. Crossley Bros., Limited, has been appointed a Magistrate for the County of Cheshire.

Mr. A. LAWTON has been appointed Chief Inspector of Gas-Meters at Leicester, under the Sale of Gas Act. He has been for sixteen years assistant at the Oldham Meter Inspection Offices.

Mr. H. JAMES YATES has, we learn, been recently elected as head of the Board of John Wright and Eagle Range, Limited; so that he now holds the dual position of Chairman and Managing-Director.

At the meeting of the Halifax Town Council last Wednesday, the recommendation of the Gas Committee that Mr. W. B. M'LUSKY, of Perth, should be appointed Gas Engineer and Manager, in succession to Mr. John Wilkinson, was confirmed.

Mr. G. BERGENT, who has had charge of the gas-making plant of the London and North-Western Railway Company at Longsight, Manchester, has retired after fifty years' service with the Company. He has been stationed at the Longsight depôt for thirty years.

Professor HAROLD B. DIXON, M.A., M.Sc., F.R.S., of Victoria University, Manchester, has been appointed for 1912 Gas Examiner for testing the gas supplied by the Salford Corporation to the districts of Eccles and Swinton and Pendlebury, in accordance with the Salford Corporation Act, 1897.

Mr. F. W. DAVIES, the Water Engineer to the Nottingham Corporation, has been appointed General Manager of the undertaking, with an increase of £200 per annum in his salary, by two annual increments of £100. Mr. W. B. BRYAN, the Chief Engineer of the Metropolitan Water Board, who has been the Consulting Engineer to the Corporation, offered to forego half his retaining fee of £200 per annum in favour of Mr. Davies; and the Water Committee accepted the offer. The arrangement with Mr. Bryan will terminate in October next; and the Committee have expressed to him their high appreciation of his services.

The staff at the Reddish Gas-Engine Works of Messrs. Richard Hornsby and Sons, Limited, have presented to Mr. A. R. BELLAMY, the Director, a handsome silver vase, as a mark of their esteem, and as a memento of his twenty-five years' connection with the works. Mr. R. Onions, the Works Manager, who made the presentation on behalf of the subscribers, gave a short account of the development of the firm's gas-engine business. He added that it was twenty-five years since the Reddish works were built by Messrs. J. E. H. Andrew and Co., Limited, on their removal from Waterloo, Stockport; and from that time to the amalgamation of the concern with Messrs. Hornsby, of Grantham, in 1906, and since, Mr. Bellamy had been at the helm. Mr. Bellamy, in the course of his reply, said the firm of Hornsby was still holding its own in the market, as the balance-sheet recently published clearly showed. The result of the past year's working was quite satisfactory to the Directors; and he personally was more than satisfied with the way in which Reddish had done its share in bringing about this result.

OBITUARY.

The death has occurred in the South of France, following an operation, of Mr. THOMAS WINCH, of Oxney Court, Dover, and Rochester, the Chairman of the Rochester and Chatham Gas Company.

Mr. ANDREW GREENHALGH, a Director of the Radcliffe and Pilkington Gas Company, died suddenly last Thursday, aged 61 years. He had attended a meeting of the Board on the afternoon of that day, and returning to Whitefield by tram-car, had an apoplectic seizure. Mr. Greenhalgh was at once conveyed to his residence at Stand; but from the first the doctor held out little hope of recovery, and after a period of unconsciousness the end came shortly after 9 o'clock that evening. Mr. Greenhalgh was connected with the bleaching industry.

The death occurred on the 30th ult., at the age of 62, of Mr. FRANK ARBER BROWN, who, as representative for a long period of the Broughton and Plas Power Company, Limited, and the Brimbone Steel Company, Limited, was well known to gas engineers and others in the Midlands and elsewhere. Deceased

was born at Woodstock, and was the son of the Rev. Birkenshaw Brown, of Wrexham. He was a widower; and he leaves two sons and two daughters. The funeral took place at Wootton Wawen, Warwickshire, last Wednesday.

The death occurred last Saturday night, at his residence, Spring Hill, Duffield, near Derby, of Mr. ABRAHAM WOODIWISS, J.P., eldest son of the late Sir Abraham Woodiwiss, the well-known railway contractor. Mr. Woodiwiss, who was 59 years of age, had been in failing health for some time, and on this account he recently severed his connection with the Derby Town Council, of which he had been a member for some years. He was one of the representatives of the Council on the Derwent Valley Water Board. He was Mayor of the borough in 1888-9, and again in the Coronation year of King Edward, was a Magistrate for the borough and county; and held high rank in Freemasonry. Deceased leaves a widow, son, and two daughters.

The death occurred on Monday last week of Mr. MEDHURST ALBERT TROUGHTON, J.P., who was well known in connection with the municipal life of Gravesend. He was born at Milton-next-Gravesend on Dec. 25, 1839, and was the only son of Mr. Medhurst Troughton of that place. On leaving school he was articled to Mr. Charles Pearson; but though he qualified as a solicitor, he never adopted the law as a profession. In 1875, he was made a Justice of the Peace, and in 1877-8 filled the office of Mayor of Gravesend, and was one of the most popular Mayors the borough had ever had. In 1886, after having been for many years a Director, he was elected Chairman and Treasurer of the Gravesend, Milton, and Northfleet Water Company; and in 1888 he was chosen for a like position in the Gravesend and Milton Gas Company. Both of these appointments he held at the time of his death. The funeral took place last Thursday, at Kensal Green Cemetery (the residence of the deceased being at Campden Hill, Kensington); and it was attended by Messrs. W. Russell and G. Wood, Directors, Mr. W. H. Troughton, Secretary, and Messrs. Joseph Davis and Arthur King, General Managers, of the two Companies with which the deceased had been so closely connected. Mr. Troughton leaves two sons and one daughter.

PRESENTATION TO MR. F. J. BYWATER.

Mr. F. J. Bywater terminated his service with the Birmingham Corporation Gas Department on Dec. 31; and on Friday, the 29th ult., about seventy members of the staff of the department met at the Saltley Gas-Works to wish him "Good-bye." Among those present were the Secretary and Manager (Mr. R. S. Hilton), who presided, Mr. John Foster (Engineer of the Windsor Street Works), Mr. W. Chaney (Engineer of the Nechells works), Dr. W. B. Davidson (Chief Chemist), Mr. James Hewett (Distributing Engineer), and many other head officials.

In asking Mr. Bywater's acceptance of a silver tea and coffee service, subscribed for by about eighty members of the staff, Mr. Hilton congratulated him on his appointment as Station Engineer at the East Greenwich works of the South Metropolitan Gas Company, and expressed the regret felt by every member of the staff at his retirement from the Birmingham Gas Department, in the service of which Mr. Bywater had spent the whole of his working life. His departure would be a serious loss; but they felt he was doing the right thing, for there were, of course, more opportunities of advancement in London—the centre of the gas profession—than could occur in Birminghan. They all looked forward confidently to the time when they would see Mr. Bywater at the head of his profession. Other valedictory speeches were made by Mr. Chaney (who succeeds Mr. Bywater as Engineer of the Saltley works), Dr. Davidson (who takes Mr. Chaney's position at Nechells), and Messrs. W. H. Johns and R. A. S. Browning.

In his reply, Mr. Bywater remarked that he had just passed through the most trying five minutes of his life. He thanked the speakers for all the kind things they had said about him, and expressed his keen appreciation of the spirit which had prompted the gift from his colleagues. Whatever there was of truth in the complimentary remarks made concerning him, he felt that he owed a very great deal to the fact that he had been privileged to work for so long under Mr. Henry Hack (the late Engineer-in-Chief of the Department), whose splendid stedfastness, integrity, and hunger for work he had always intensely admired. He paid a tribute to the good and loyal service rendered by the whole of the staff at Saltley during the time he had acted as Engineer. Whatever his fortunes in the future, he said, he could not hope to meet a better set of fellows; and Saltley would always be remembered by him as his home. He understood that in addition to the gift handed to him that evening, he was to receive at a later date an illuminated list of the names of the subscribers; and they would not think it any reflection on the intrinsic worth of their gift, when he stated that this list would be appreciated by him to an even greater degree—containing, as it would, the names of old friends, and being reminiscent of the many happy times he had spent while under the Birmingham Gas Department.

A movement is on foot to entertain Mr. W. B. M'Lusky, of Perth, to a complimentary dinner before he takes up his new duties at Halifax. The dinner will be held on the 26th inst., in the Station Hotel; and the Lord Provost of Perth will preside. Mr. Yuill, of Dundee, is Hon. Secretary of the movement.

ELECTRICITY SUPPLY MEMORANDA.

Seabrook Worships Expediency—New Troubles Caused by Gas—Artificial Illumination and Ventilation—Interesting Events Illustrated and Unillustrated—Contributing to the Maintenance of the Competing Undertaking.

A PAPER on "Residence Tariffs" has been read before the Institution of Electrical Engineers by Mr. A. H. Seabrook, of Marylebone fame. No one ought to be more competent than he to read a paper on this subject; for we do not know a single electricity undertaking that has taken unto itself such a medley of tariffs as the one at Marylebone. Mr. Seabrook has to thank his lucky stars that he has an exceptional district with which to deal—a district in which there is a large proportion of people who are not what one would call poverty-stricken. But even among them, no one tariff scheme seems to fit all circumstances; and so Mr. Seabrook has adopted, partially or wholly, practically all the systems on which he can lay hands. Piously, the General Manager of the Marylebone Electricity Department murmurs that no tariff is theoretically sound unless it differentiates clearly between standing and running costs. Having said this, he shunts inconvenient theory and principles aside, to make place for a little god of his own, which he calls Expediency, and which he devoutly worships. He contends that this deification of expediency and the renunciation of theoretical correctness is justified where there is severe competition, from which it may be taken that he does not find the Gaslight and Coke Company prepared to bow before his bull-like rush after custom at rates that come within the expedient category, and are based on practically no other principle. We have learned a few things about the lengths to which expediency will carry the Marylebone electricity caterers; and between consumer and consumer these lengths, in our opinion, are not in any way justified.

During the discussion on the paper—a discussion not yet completed—the "telephone" system (which Mr. Seabrook says brings the department in £25,000 a year in lump sums, paid in advance) was poignantly criticized. The system is composed of two charges. First there is the primary one based on 70 per cent. of the connected lighting load at the high figure of £14 per kilowatt per annum, not counting convenience and decorative lights, and not counting any consumption for uses other than lighting. Then there is the secondary charge of 1d. per unit; and this 1d. per unit is for any purpose. It will be seen that the primary charge is based entirely on the lighting business; and the department enacts that, to come under this tariff, the whole premises shall be wired for electric lighting, and for lighting purposes electricity shall be exclusively employed. It is thus observed that, under this system, the whole of the standing charges are thrown on to the lighting load; and that, in effect, all the units supplied for purposes other than lighting escape the standing charges, and are sold at the flat-rate of 1d. per unit. All principles and theoretical considerations are thus thrown to the winds. Nothing where Mr. Seabrook is must stand in the way of expediency—no matter whether right or wrong. And we suppose this will be the answer he will make to his critics when he comes to reply to them. We hope expediency will not some day let Mr. Seabrook down with a mighty crash.

Just before Christmas, "The Man about Town"—that is to say, Cardiff Town—wrote, in the "South Wales Echo," some of the most amazing absurdity (we cannot call it anything else) about gas and electricity that we have lately come across. We cannot tell what possessed him to do so; but it only shows how foolish a writer in a daily paper can make himself appear in the eyes of competent judges by dealing with a question that he does not thoroughly understand. This particular "Man about Town" writes in the most extravagant language. He insinuates that everywhere a man goes, he deliberately poisons himself by using gas. His words are: "He poisons himself in his house and the churches with foul air, and refuses to learn the lessons for which hundreds of thousands of sufferers pay in the coin of sickness and death." How horrible! A little further on he remarks: "One goes into gas-lighted shops, where the incandescent system is in operation, and notes the pale-faced anæmic assistants who are being prepared in wholesale fashion for the consumptive's torture and imprisonment in a sanatorium." What a lively imagination! It would be interesting and educative to the students of the relation to health of artificial illuminants if "The Man about Cardiff Town," when his ramblings allow him a little leisure for the purpose, would tell them in what way gas lighting poisons the atmosphere, and how it assists in producing an anæmic appearance in shop assistants. Later in his notes he states that the air of the Park Hall, illuminated by an "excessive" number of incandescent gas-flames, was "hot, foul, dry, and poisonous;" and he finds a difference since the place has been illuminated by electric glow lamps. We understand, however, from an interview with Mr. George Clarry, the Manager and Secretary of the Cardiff Gas Company, published in the "South Wales Daily News," that the major part of the hall is still lighted by incandescent gas-burners; and that a scheme is now under consideration for the illumination of the place with gas not only more efficiently, but on a consumption that is quite negligible in such a large hall.

What do these several statements on the part of "The Man about Town" amount to. He alleges that gas lighting poisons the atmosphere. We have asked him what he means by this. In the second place, he suggests that the substitution of electric

lighting for incandescent gaslight alone establishes improved conditions. He may say what he likes about the Park Hall; but the air of the hall lighted by gas and lighted by electricity—ventilated under both circumstances in precisely the same manner, the ventilation being properly effected—would be in a superior sanitary condition, with a large audience in the place, under gas lighting than under electric lighting, for the reason that the former promotes the upward travel of the air (with the simplest of ventilating openings) while the electric light does not. Where electric light is used, the Electricity Publicity Committee advise that electrically worked fans be utilized. For what purpose? For extracting the air vitiated by the poisonous organic emanations of human respiration. Electric lights do nothing towards causing the air to circulate, and keeping it in a clean state; and therefore, it is the worst light for places of public assembly. It cannot be expected that "The Man about Cardiff Town" knows much as to the lecture theatre of the Institution of Electrical Engineers. Let us introduce him to it. The hall is an electrically lighted one; and at the time to which we are referring—early last year—it was fitted with a large electric fan. After a meeting of the members on Jan. 26 last, this is what the "Electrical Times" had to say about the atmosphere of the hall: "The evening was rather sultry, there was a large audience, and complaints of the poor ventilation were heard on all sides. Fortunately, it is quite an easy defect to remedy; it is not a question of excessive heating, so much as of stagnant air, which is not being passed out of the building quickly enough." As we have said before, to a medical man, "stagnant air" has a very significant meaning; and it covers much impurity and other undesirable conditions. Let us turn to Sheffield. Early last year, we learned that the atmosphere of the electrically lit City Council Chamber was found so noxious that the Medical Officer of Health was instructed to make a scientific examination of the air; and he found it contained four to five times more carbonic acid than the outside air. The carbonic acid must have been of the noxious character produced by human respiration. Special means had to be taken to remedy this condition. We could go on referring to instances of this sort. But of what avail? "The Man about Cardiff Town," in his wisdom and lofty knowledge of these matters, may refuse to credit them. To men of technical competence, they show that places of assembly that are electrically lighted have to be ventilated by special and costly means; whereas with gas-lighting, the heat is sufficient to cause an upward flow of the air, which can be ejected through simple ventilating openings. There are more points bearing upon this question which must be omitted on this occasion, as other topics demand comment; but surely enough has been said to show the "South Wales Echo" writer that there are more sides to this important question than he fancied when writing the notes which have drawn forth this comment. By the way, it is noteworthy that the Cardiff Gas Company's ordinary stock rose 4½ points last month; and this fact, coupled with an unprecedented demand for gas, does not indicate that the terrible conditions portrayed by "The Man about Town" have shaken the public belief in gas as an investment, or as a servant of copious utility.

"Meteor" or someone else connected with the "Electrical Times" has a highly cultivated selective power as to what are proper events for illustration in the paper. In the last issue but one, there was published a view of a Barrow-in-Furness shop with the upper room windows wrecked, to show the effects of a gas explosion; but the "Electrical Times" failed to give a photograph of the Clapham, Accrington, Edinburgh, Kilburn, Maidstone, and many other electrically caused fires, including three serious City ones last year that the Acting Electrical Engineer to the Corporation asserts were due to electrical causes. Nor did the paper give illustrations of scenes at the funerals of the victims of the Clapham, Accrington, Edinburgh, and Maidstone fires. Nor, again, has it published views of the recent Strand and Nottingham explosions caused by the fusing of electric cables, the last-named of which wrecked the Albert Hotel. Experts have been busy inquiring into the disaster; and it is understood that very little doubt exists now as to the fusing of the cable above the cellars of the hotel having generated the explosive gas from the bitumen covering. It is a pity that the person responsible for the illustrations in the "Electrical Times" has overlooked all these sensational occurrences. The "Electrician" did not miss the Nottingham catastrophe; but this paper cannot be complimented on the deceptive character of the wording that accompanied the reproduction of the photograph. Over the illustration appeared the words "Playful Gas." No mention was made as to the source of the gas. Under the illustration were the words: "Not due to the fusing of an electric wire." Of course, the line should have read: "Due to the fusing of an electric cable." Will the "Electrician," for Truth's sake, correct the misrepresentation of this matter?

It is constantly being stated by municipal electricity suppliers that gas companies ought not to be allowed to oppose at Local Government Board inquiries into questions of loans for electricity supply. Seeing that this is about the only time they are permitted to open their mouths in protest, it is rather hard on them that objection should be raised. Considerable ratepayers as they are, they are not granted the right to vote for a representative on the local authority; if a gas company director gets on the council, he is generally ruled out of order if he utters a syllable on electrical contract matters; or if he lifts one finger in assent or dissent, he is told that he is acting *ultra vires*. Not that he need believe all the legal adviser to the council says. But notwithstanding, the gas companies in most towns are generally about the biggest contributors to the local finances. A very good example of the position of a gas company in connection with the running of an electricity supply undertaking is shown by that of the Gaslight and Coke Company, in relation to Barking. There the District Council have asked the Local Government Board to sanction a further loan of £11,000 for electricity supply purposes. Last year the loss on the concern was £1037. Up to 1910-11, the loss had been £6141, all of which has been charged on the rates. The Gaslight Company are the largest ratepayers in the district—in fact, the rateable value of their property in the area is about one-third of the whole. The gas supply of Barking is in their hands. This being so, the position of the Company in respect of losses on the electricity undertaking—losses charged upon the district rates—is readily seen. When the question was raised, at the Local Government Board inquiry, as to why the Council did not increase the price of electricity so as to obviate losses, the Inspector (Mr. T. C. Ekin) was informed that they could not do so owing to the competition from gas. It comes to this, then, that the Gas Company, through conscientiously serving the district at reasonable prices, have to pay a large part as ratepayers towards the maintenance of competition against themselves, carried on at unremunerative prices. This is the monstrous position that the Council seek to justify. Further, in addition, to the large contribution made by the Gas Company to the local exchequer, one-third of the ratepaying workmen who live and spend their wages in the district are employed by the Company. These men know that, in relation to the business done, the rate of employment and consequently the volume of wages is higher in the case of gas supply than in that of electricity supply. Mr. J. N. Reeson, the Engineer at Beckton, and Mr. F. W. Goodenough, the Controller of Gas Sales, made an appeal to the Inspector on these and other grounds not to recommend the granting of the new loan—at any rate, unless the Council raise their prices for current to a figure that will make both ends meet without calling upon the ratepayers to help to pay the due obligations of the users of electricity. The Local Government Board cannot look upon the existence of the ability to permanently run a municipal trading concern at a loss to the disadvantage of the largest ratepayers in the area as being in any way defensible.

Ships' Anchors and Submerged Pipe-Lines.

The depth to which the flukes of a ship's anchor will penetrate into the bottom of a harbour has an important bearing upon the location of submerged mains. A portion of the Catskill water supply for New York City will be carried under the Narrows—the channel which joins the upper and lower harbours—to Staten Island or the borough of Richmond. The subaqueous crossing will be effected by a 36-inch flexible-joint pipe-line. As all the ocean traffic to and from the port of New York passes through the Narrows, it was important to lay the pipe-line low enough to escape damage by anchors dropped from passing ships. To obtain information regarding the penetration of anchors, the Board of Water Supply undertook tests approaching actual conditions. The following particulars of them appeared recently in "Engineering Record." A tug 200 feet long and of 1600 H.P., equipped with anchors of various models and weights up to 5000 lbs. and auxiliary tackle, was used. Three different types of anchors were tried for comparison under the same conditions in the softest bottom encountered in the region of the crossing. The Board report that the greatest penetration was that of a stackless anchor of 3200 lbs., the tip of the fluke of which apparently reached a depth of 10 ft. 6 in. When this test was made, however, owing to a tidal velocity of three to four miles per hour, due to a recent freshet, it was impossible to take absolutely reliable soundings or measurements. The general conclusions were that anchors very seldom penetrated any material over 6 feet, and in the softest material encountered not more than 10 feet.

What is described as the largest order for steel pipe ever placed by any firm in the world has been let by a Calgary firm. The Canadian Equipment and Supply Company, Limited, have just ordered from the United States Steel Corporation upwards of 300 miles of pipe to convey natural gas from Bow Island to Calgary. The order, together with the couplings, will run into about $3,000,000. There will be 2500 cars of pipe and about 300 cars of couplings. About 180 miles of pipe will be 16 inches in diameter, and the remainder will range from 14 inches down to 4½ inches.

Meters on street-sprinkling carts are advocated in the annual report of Mr. Robert Laidlaw, the General Superintendent of the Cincinnati Water Department. The present rule of charging £3 12s. per month for a 250-gallon cart and £6 12s. per month for a 550-gallon cart, regardless of the territory they sprinkle, is said to be unreasonable. The contractor who has a small territory to sprinkle and can cover it in four hours per day pays the same amount as the large contractor who sprinkles during the whole day; the latter using two or three times as much water as the former. Under the present rule, it is stated, the men are very careless. They flush the streets, making them seas of mud, and in many cases are said to injure the pavements. To minimize these complaints, Mr. Laidlaw recommends that a 2-inch meter be attached to every sprinkling waggon, and that contractors be charged 6d. per 620 gallons for the water used.

RIVAL INDUSTRIES.

RETRACTATION BY THE "ENGINEERING CORRESPONDENT" OF THE "DAILY TELEGRAPH."

[Reprinted from Yesterday's Issue of Our Morning Contemporary.]

APPLIED science is developing at such a rapid rate that our conclusions concerning the superiority of one piece of apparatus over another may require modification, as time goes on. Thus, some years ago the reciprocating steam-engine held the field as a prime mover almost unchallenged. Of late years, the steam turbine internal combustion engine and the hydraulic turbine have not only challenged that position, but for many practical purposes beaten the reciprocating steam-engine. In several branches of applied science work there is great competition between rival industries. As an example, we may quote that which exists between the makers of steam-engines and internal combustion engines. Sometimes one industry obtains an advantage, and then a new invention comes along and completely alters the position of affairs.

During the last quarter of a century there has been intense, and at times somewhat acrimonious, competition between electrical and gas engineers. We are glad to see indications of a rather more friendly spirit among the rivals; and we sincerely hope that nothing which appears in these columns will be considered by either of them as being written in any spirit of prejudice or partizanship. We most emphatically wish to see strenuous competition, in the belief that the public thereby benefits, but we do not wish to be considered unfair in our judgments concerning the development of any one branch of applied science.

WHITEHALL AND WESTMINSTER.

We have made this explanation, because we unwittingly caused some considerable resentment to be felt by gas engineers concerning a description of the latest progress in connection with flame arcs which appeared in this journal early in October. We are bound to say that, having gone very fully into the subject since that date with both gas and electrical engineers, we find that some of the complaints are justified, and we therefore propose, in common fairness to our readers, to modify some of the statements then made. We find that sources of information in which we had great confidence were not altogether reliable. The first matter to which exception was taken was our marked preference of the arc lamp for shop lighting and factories, and especially the general statement that these flame arcs are superior in all respects to incandescent gas. We have been referred to the high-pressure lighting with inverted gas-lamps in Whitehall and other parts of Westminster, the results of which are certainly satisfactory to the users of the roads in which the lamps are placed. As for the costs of these lamps, we find it very difficult indeed to reconcile the figures (and their interpretations) published by the gas and electrical engineers, and we therefore propose to leave that an open question until more evidence is to hand which we consider trustworthy. With regard to shop lighting, the gas engineers have in certain parts of London replaced arc lamps by high-pressure incandescent gas, and the electrical engineers have replaced gas in other parts. Local conditions and local enterprise will very much affect the decision of the shopkeeper; and we are quite willing to let the public know that such is the case. After all, the local shopkeeper may be trusted to get the best terms from either of the two rivals.

HOUSEHOLD LIGHTING.

The gas engineers emphatically deny that it is the unanimous opinion of doctors and scientific men that for the good health of the occupiers every house should be lighted electrically. Since they produce a list of medical men who state otherwise, we think it right to mention this fact. "When doctors disagree"—well, the only thing for the ordinary man is to ask his own doctor. It is also denied by the gas engineers that paint and leather bindings of books are affected by sulphur compounds from the gas as produced and purified to-day. Here, again, we find that opinions widely differ, and we are not prepared to accept either the *pro* or the *con* without fuller evidence. As for the point that we should have stated that the carbonic acid gas given off by the gas-burner is harmless because it is sterile, we were quite unaware of that fact; and we quote Dr. Rideal as the authority for the statement that such gas is harmless. The gas engineers say that carbonic acid, as produced by human respiration, is laden with organic matter, which is not the case with gas properly consumed.

It is not intended at present to deal with figures concerning relative costs of the rival illuminants, because it is desired to have some from quite independent sources. We have suggested that independent tests should be made, but, seemingly, no response is offered to our suggestions. As for our general position concerning gas and electricity, it may be well to quote from an article by the writer which appeared in our issue of June 26. It was therein said: "We have stated before that we hold no especial brief for gas or electricity, and there is little need to emphasize the fact that we hope to see both these branches of engineering work develop. There is room for both." We are impelled to say that our own personal experience in the past (probably because we have been brought into closer contact with electrical than with gas engineers) has been that the electrical engineers have been more enterprising than their rivals. We have, of course, always endeavoured to keep our readers fully aware of the latest developments in all applied science work. Remarkable developments may be expected in the next decade; and the householder should see how he can obtain good value for his money by keeping aware of technical developments. We are bound to say that, in our endeavour to make them appreciate recent advances in electric lighting, we unwittingly did less than justice to a rival industry, and for that reason we are only too pleased to present the point of view of the gas engineer. At the same time, we wish to make it quite clear that we hold no brief for either industry, but shall record the latest advances which are taking place in both if they appear to be of sufficient importance.

[A further letter from "Engineering Correspondent" appears to-day in our "Correspondence" columns.]

THE LATEST GAS UNDERTAKINGS RETURNS.

Official Figures as to Gas Supply.

THE returns relating to the gas undertakings of the United Kingdom for the year ended Dec. 31, 1910, in the case of Companies, and March 31, 1911, for the Local Authorities, were issued last Thursday—having been ordered for printing on the 11th of December only. The immediately preceding returns were published one month earlier; the order for printing having been given on the 15th of November. The number of pages occupied by the returns is the same as before—101 pages for the Companies and 59 for the Local Authorities.

Information is furnished in reference to 809 undertakings this year, compared with 794 before. The new comers among the 511 Companies are Builth, Burnham, Comber, Compstall, Dinnington, Garnant, Gowerton, Highbridge, Llanidloes, Ogley Hay, Ripley, and Wicklow; but West Ham and Sandiacre drop out. Among the 298 Local Authorities, there are five new comers—viz., Carnoustie, Egremont, Lisburn, Little Hulton, and Prestatyn. The total capital authorized (including other purposes than gas supply in certain cases) is given as £157,341,047, of which £134,683,695 has been paid up and borrowed. For the Local Authorities, the capital authorized is £47,140,175, and the amount borrowed £42,490,504. In the case of the Companies, the figures are: Amount authorized, £110,200,872, being £88,047,473 share and £22,153,399 loan capital; amount paid up and borrowed, £92,193,191. The receipts are: Companies, £20,446,438; Local Authorities, £10,829,758—a total of £31,276,196.

The statistics relating to working show that 15,397,783 tons of coal were carbonized; the quantity of gas produced being 198,733,354,000 cubic feet, of which 182,833,928,000 cubic feet were sold. The total make includes 23,456,162,000 cubic feet of water gas and 100,000 cubic feet of acetylene gas. The totals in the preceding returns were: Coal, 15,225,320 tons; gas made, 193,547,394,000 cubic feet; gas sold, 177,686,943,000 cubic feet; water gas made, 23,626,189,000 cubic feet; acetylene gas made, 99,792 cubic feet. At the date to which the latest returns were made up, there were 36,122 miles of mains in use to supply 6,417,849 consumers and 720,785 public lamps. The preceding figures were: Miles of mains, 35,230; gas consumers, 6,164,066; public lamps, 712,903.

Comparing the figures furnished by the present returns with those contained in similar returns for the previous nine years, it will be seen that the Companies show as follows:—

Year.	Share and Premium Capital Paid Up.	Loan Capital Issued.	Receipts.	Expenditure.
1901. . .	£62,775,845	£12,201,533	£17,955,187	£14,537,797
1902. . .	64,299,112	12,829,925	17,205,002	13,167,186
1903. . .	67,417,798	13,451,381	17,756,626	13,214,322
1904. . .	68,953,306	13,775,734	17,828,872	13,397,727
1905. . .	70,605,726	14,176,599	17,617,598	13,410,307
1906. . .	72,008,451	14,467,842	18,166,087	13,671,369
1907. . .	73,152,891	14,645,271	19,567,336	14,884,982
1908. . .	74,328,645	14,944,060	20,013,159	15,475,933
1909. . .	74,952,664	15,168,298	19,951,779	15,097,658
1910. . .	76,797,028	15,396,163	20,446,438	15,308,928

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1901. . .	8,580,365	97,386,618,553	2,048,359	326,209
1902. . .	8,520,004	99,676,048,000	2,197,987	333,308
1903. . .	8,528,823	101,490,084,000	2,385,348	335,363
1904. . .	8,673,343	105,311,980,000	2,588,917	343,908
1905. . .	8,722,145	109,823,682,000	2,813,156	350,113
1906. . .	8,922,781	114,528,923,000	3,023,619	356,070
1907. . .	9,240,280	118,699,705,000	3,230,993	362,986
1908. . .	9,281,738	119,985,109,000	3,399,193	367,950
1909. . .	9,175,532	122,930,431,000	3,573,796	369,882
1910. . .	9,236,081	125,830,234,000*	3,751,703	371,665

* Including 18,239,899,000 cubic feet of water gas. Number of cubic feet sold 115,342,163,000.

The somewhat similar figures for the Local Authorities are—

Year.	Amount Borrowed, including Annuities (not deducting Repayments).	Receipts.	Expenditure (exclusive of Amount in the next Column).	Interest, &c., Paid.*	Net Profit after Payment of Items in preceding Column.
1901-02 .	£34,045,442	£9,300,567	£7,630,856	£1,467,232	£414,091
1902-03 .	35,738,023	9,554,984	7,215,502	1,584,985	793,764
1903-04 .	37,103,279	9,819,685	7,182,008	1,700,405	967,194
1904-05 .	38,512,295	9,546,682	7,052,474	1,738,682	790,450
1905-06 .	39,401,896	9,636,107	7,085,710	1,799,094	798,210
1906-07 .	40,089,167	9,843,243	7,211,987	1,843,122	832,341
1907-08 .	40,712,159	10,500,416	7,839,122	1,882,427	827,454
1908-09 .	41,435,988	10,506,480	7,998,776	1,905,810	659,445
1909-10 .	42,002,322	10,398,263	7,710,985	1,970,241	767,961
1910-11 .	42,490,504	10,829,758	7,902,451	1,963,015	973,934

* These figures include: (1) Interest paid on loans; (2) amount paid for annuities; (3) amount of loans repaid; (4) amount paid for redemption of annuities; (5) amount placed to sinking fund.

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1901-02. .	5,522,264	59,300,273,086	1,872,633	287,887
1902-03. .	5,589,215	60,902,739,000	1,970,738	294,828
1903-04. .	5,673,013	62,717,759,000	1,945,777	301,308
1904-05. .	5,622,259	63,335,696,000	2,148,260	310,275
1905-06. .	5,758,180	65,081,109,000	2,250,919	315,678
1906-07. .	5,923,476	67,312,153,000	2,339,914	321,910
1907-08. .	6,166,473	69,786,988,000	2,434,183	327,278
1908-09. .	6,112,569	69,933,629,000	2,516,927	332,746
1909-10. .	6,049,788	70,616,963,000	2,590,270	343,021
1910-11. .	6,161,702	72,903,220,000*	2,666,146	349,120

* Including 5,216,263,000 cubic feet of water gas and 100,000 cubic feet of acetylene gas Number of cubic feet consumed, 67,491,765,000.

As usual, the returns contain particulars in regard to the proportion of water gas used, and also indicate the undertakings in which materials other than coal are employed in the manufacture of gas. The following is a list of the Companies and Local Authorities making water gas; the figures in parentheses showing the maximum proportions (except where averages are stated) of its admixture with coal gas.

Companies.

Aldershot (not stated).
Alliance and Dublin (43).
Aylesbury (16·9).
Barking (30).
Bath (50).
Bexhill (34·18).
Bilston (10).
Bish. Stortd. (37·16, av. 25).
Bognor (30).
Bournemouth (35·5).
Brentford (31·5).
Bridgwater (25).
Bridlington (av. 33).
Brighton (43).
Bromley and Crays (25).
Bromsgrove (10, meth. hydrogen).
Cardiff (25).
Chigwell (33).
Cleethorpes (16).
Colchester (26).
Commercial (44·42).
Croydon (42·7, av. 28·8).
Dartford (19·9, one day only).
Dorking (25).
Durham (20 estimated).
Eastbourne (35).
Epsom (33⅓).
Falmouth (20).
Felixstowe (18·64).
Folkestone (33).
Gaslight and Coke (*).
Gravesend (40).
Guildford (20 to 25).
Hampton Court (35·3).
Harrow (40 calculated over one week).
Hartlepool (25, av. abt. 20).
Hastings (38·4†).
Hornsey (50).
Horsham (15).
Hull—British (30).
Hythe and Sandgate (40).
Ilford (24·22).
Ilfracombe (16·5, av. 7·8)
Ipswich (24).
King's Lynn (24·1).
Kingston-on-Thames (25).
Liverpool (50).
Lea Bridge (49, av. 42·7).
Londonderry (15, av. 10).
Maidenhead (35).
Maidstone (20).
Malton (33).
Marlborough (30).
Merthyr Tydfil (30).
Mid Kent (25.)
Mitcham (39·5).
Newcastle (11·4 one wk.).
Newport, Mon. (19·1).
North Middlesex (54·34‡).
Norwich—British (34·7).
Plymouth (43·10).
Portsea Island (32·4).
Prescot (33).
Preston (38·6, av. for one [week).
Ramsbottom (5).
Reading (41·8).
Redhill (35).
Rhymney (15).
Rochester (40).
Romford (31, av. 29).
Rushden and Higham Ferrers (16·5, av. 13·1).
St. Albans (aver. 30).
Scarborough (26·8).
Southampton (36).
Southend (35·31).
Southgate and District (52).
South Shields (29·87, one day only).
Staines and Egham (25).
Stretford (37·78).
Swansea (25).
Swindon United (43).
Taunton (35).
Tonbridge (23).
Torquay (39·9, av. 26·13).
Tottenham (29·2).
Truro (50).
Tunbridge Wells (25 to 30).
Uxbridge (20).
Wandsworth (36, aver. 25).
Watford (31).
Weston-super-Mare (30).
Wexford (25).
Winchester (30).
Wolverhampton (not stated).
York (26·91).

* Of the total quantity of gas sent out by the Company, 10 per cent. was unmixed with water gas. As regards the remainder, 54 per cent. contained a maximum proportion of 27 per cent. of carburetted water gas; 10 per cent., a maximum proportion of 29 per cent.; 11 per cent., a maximum proportion of 34 per cent.; 10 per cent., a maximum proportion of 35 per cent.; 8 per cent., a maximum proportion of 40 per cent.; and 7 per cent, a maximum proportion of 43 per cent. † Average for the year, 29·75 per cent. ‡ One day only; average, 42·5 per cent.

Local Authorities.

Aberdeen (25).
Accrington (25).
Ashford (31·5, av. 10·5).
Barrow-in-Furness (15·9).
Belfast (not stated).
Birkenhead (33·33).
Birmingham (25).
Blackburn (25).
Burnley (40).
Carlisle (33·3).
Chorley (20).
Coventry (23·01).
Devizes (35).
Devonport (40).
Dundee (25).
Edinburgh (14).
Hebden Bridge (10 to 25).
Leeds (13·7).
Leicester (11·64).
Leigh (10).
Lincoln (33⅓*).
Longton (about 30).
Loughborough (25).
Manchester (16·09 on the total output).
Mansfield (14).
Middlesbrough (no limit).
Nelson (allowed 35, actual 22).
Nottingham (9·98).
Oldbury (about 20).
Oldham (39†).
Paisley (0·02 oil gas).
Pontypridd (36·99).
Rochdale (25).
Smethwick (20).
Southport (20·61).
Stockport (25).
Stockton-on-Tees (22).
Tipton (1·83).
Todmorden (18·3).
Torquay (36·5 meth. hydrogen).
West Bromwich (30).
Wigan (12·85).

* In the daytime; none at night. † At one station, and on one day only.

Two new Companies appear in the list—viz., King's Lynn and Mid Kent; and three (Gosport, Waltham Abbey, and West Ham) drop out. Among the Local Authorities, Nelson, Mansfield, and Torquay (St. Mary Church) appear, and Halifax and Stafford drop out.

The extent to which oil, petroleum spirit, carburine, or "other material" is being utilized for the production of gas will be seen from the following list of the Companies and Local Authorities making returns.

Companies.

Aldershot.
Alliance and Dublin.
Alton.
Aylesbury.
Barking.
Bath.
Bexhill.
Bilston.
Bishop's Stortford.
Bognor.
Boston.
Bournemouth.
Brentford.
Bridgwater.
Bridlington.
Brighton and Hove.
Bristol.
Broadstairs.
Bromley and Crays.
Bromsgrove.
Bude.
Canterbury.
Cardiff.
Chigwell.
Cleethorpes.
Colchester.
Commercial.
Croydon.
Dartford.
Derby.
Dorking.
Dover.
Durham.
Eastbourne.
East Grinstead.
Epsom and Ewell.
Exeter.
Falmouth.
Fareham.
Felixstowe.
Folkestone.
Gaslight and Coke.
Grantham.
Gravesend.
Guildford.
Hampton Court.
Harrow and Stanmore.
Hartlepool.
Hastings.
Hornsey.
Horsham.
Hull (British Co.).
Hythe and Sandgate.
Ilford.
Ilfracombe.
Ipswich.
Isle of Thanet.
King's Lynn.
Kingston-on-Thames.
Lampeter.
Lea Bridge.
Littleborough.
Liverpool.
Londonderry.
Maidenhead.
Maidstone.
Malton.
Marlborough.
Merthyr Tydfil.
Mid Kent. [don.
Mitcham and Wimble-
Newcastle-upon-Tyne.
Newport (Mon.).
North Middlesex.
Norwich (British Co.).
Plymouth.
Portsea Island.
Prescot.
Preston.
Ramsbottom.
Reading.
Redhill.
Rhymney & Aber Valleys.
Rochester.
Romford.
St. Albans.
Scarborough.
Shrewsbury.
Southampton.
Southend.
Southgate and District.
South Shields.
Staines and Egham.
Stirling.
Stretford.
Swansea.
Swindon.
Taunton.
Tonbridge.
Torquay.
Tottenham.
Truro.
Tunbridge Wells.
Tynemouth.
Uxbridge.
Wandsworth and Putney.
Watford.
Weston-super-Mare.
Wexford.
Winchester.
Wolverhampton.
York.

Local Authorities.

Aberdeen.
Abergavenny.
Accrington.
Airdrie.
Alloa.
Alva.
Arbroath.
Ashford.
Ballymena.
Barrow-in-Furness.
Belfast.
Birkenhead.
Birmingham.
Blackburn.
Blackpool.
Burnley.
Carlisle.
Chorley.
Coventry.
Dalton-in-Furness.
Darwen.
Devizes.
Devonport.
Dumfries.
Dundee.
Edinburgh and Leith.
Ellon (gas oil only).
Falkirk.
Glastonbury.
Greenock.
Hebden Bridge.
Helensburgh.
Heywood.
Kirkintilloch.
Leeds.
Leek.
Leicester.
Leigh.
Lincoln.
Liverpool (Fazakerley).
Llandudno.
Longton.
Loughborough.
Manchester.
Mansfield.
Middlesbrough.
Middleton.
Mossley.
Nelson.
Nottingham.
Oldbury.
Oldham.
Paisley.
Perth.
Pontypridd.
Portsoy (acetylene gas).
Rochdale.
Smethwick.
Southport.
Stockport.
Stockton-on-Tees.
Tipton.
Todmorden.
Torquay (St. Mary Ch.).
Walsall.
Warrington.
West Bromwich.
Wigan.

The new names in the preceding lists are the East Grinstead, King's Lynn, Lampeter, Mid Kent, and Wolverhampton Gas Companies, and the Ballymena, Falkirk, Glastonbury, Leicester, Mansfield, and Nelson Local Authorities. The Coatbridge, Gosport, Northfleet, Sutton and Hooton, Waltham Abbey, and West Ham Companies, and the Darlington, Dunfermline, Halifax, Hamilton, Ilkeston, Market Harborough, Oswaldtwistle, St. Helens, Stafford, and Stratford-on-Avon Local Authorities drop out.

The Gas Commissioners of Portsoy used 10 tons of carbide of calcium in the manufacture of 100,000 cubic feet of acetylene gas, of which 73,000 cubic feet were employed for private and 25,000 cubic feet for public lighting—together, 98,000 cubic feet, at the price of 5s. per 100 cubic feet. At the date to which the returns were made up (March 31 last), there were 70 consumers, about four miles of mains, and 72 public lamps.

The London and Southern District Junior Gas Association will next Saturday afternoon visit the Westminster compressing station of the Gaslight and Coke Company, and in the evening the printing works of the United Newspapers, Limited. Before leaving Westminster for the printing works, it is proposed to hold an informal meeting, at which the President will open a discussion on "The Nomenclature of Lighting." On Friday, the 26th inst., there will be a meeting at the Westminster Technical Institute, which (in consequence of the unavoidable postponement of the paper that was to be read on this occasion) will be mainly devoted to informal discussion. A discussion on "Efficiency, and its Relation to the Permanent Satisfaction of the Consumer" will be opened by a short paper by Mr. H. H. Creasy, of the Gaslight and Coke Company, and one on the "Condensation of Coal Gas," by an introduction by Mr. F. A. Frost, of the South Metropolitan Gas Company.

GAS BILLS FOR 1912.

[First Article.]

The Bills are available that it is proposed to promote in the ensuing session of Parliament; and in this first instalment of their review, we deal with those new or limited gas companies who are seeking incorporation and full statutory powers.

In the year 1900, the Bawtry Gas Company, Limited, were incorporated under the Companies Acts; and the authorized share capital is £2000, of which £1700 has been issued, and is fully paid up. No money has been borrowed on mortgage. Gas is being supplied in Bawtry and in part of the parish of Harworth; and the business is increasing. In certain adjacent areas, there is no supply of gas; and so the Company desire to extend their operations in all directions by having the necessary powers conferred upon them. In part of the area defined for the limits of supply, the Tickhill Gaslight, Coal, and Coke Company, Limited, and the Gringley and District Gas and Coal Company are supplying gas; and it is considered that it would be a public advantage if these concerns were vested in the Company to be incorporated under this measure. The new Company will, if the Bill succeeds, be known as the Bawtry and District Gas Company. The clauses applying to incorporation are all of the usual order. The capital proposed is £35,267, whereof £2267 is to be known as the original capital; and £33,000 is marked as additional capital, of which not more than £15,000 is to be raised as preference shares or stock. The borrowing powers contemplated are on the usual one-third basis. The dividends proposed are 10 per cent. on the original capital, 7 per cent. on that part of the additional capital issued as ordinary, and 6 per cent. on the portion raised as preference. Power to create a special purposes and reserve fund is desired. The first Directors are to be Mr. Henry Ellison and Mr. John H. Brearley, and one other person to be nominated by them. The auditors are to be professional accountants. The limits of supply are fully defined; but the Company are not to supply in the areas of the two Companies already mentioned until their undertakings have been acquired. Provision is made for the purchase of the two concerns by agreement. The standard price of gas suggested by the promoters is 4s. 7d. per 1000 cubic feet; the sliding-scale being on the usual terms for 10 and 7 per cent. capital. The prepayment meter clause is on the "model" lines, excepting in respect of the hire of meter without fittings, and the excess rate here proposed is 8d. Fourteen candles and the No. 2 burner are the standards suggested in respect of quality. The Company have inserted a stand-by clause referable to both private gas plant and a supply of electricity. [*Parliamentary Agents: Messrs. Torr and Co.*]

What appears to be a Bill that will be competing with the foregoing for parliamentary favour is that of the Bawtry and Tickhill Gas and Water Company. This Company are proposing to give a supply of both gas and water. In the preamble, it is stated that "certain parts of the area of supply as defined by the Act are supplied with gas by the Bawtry Company and the Tickhill Company (which companies . . . have no statutory powers); and it is expedient that the undertakings of those companies should be acquired by, and vested in the company." The promoters propose a capital of £25,000, with one-third borrowing powers. The purchase of the Tickhill and Bawtry Companies is provided for; the terms to be agreed upon or determined by arbitration. The water supply area is defined; and all the requisite works and supply powers are included. In regard to gas supply, the limits are named; and likewise all manufacturing and supply powers are incorporated in the measure. The maximum price proposed by the promoters is 5s. per 1000 cubic feet, for gas of a standard quality of 14 candles, tested by the No. 2 burner. The maximum price to be charged by the Company for gas for public lighting, it is suggested, shall not exceed 4s. 3d. per 1000 cubic feet. [*Parliamentary Agents: Messrs. Baker and Co.*]

In the preamble to the Bill for incorporating and conferring powers upon the Bordon and District Gas Company, we are confronted by a long historical narrative; and yet it is practically all history of recent making. By the Woolmer and District Gas Order of 1908, Frederick William Talbot was authorized to construct and maintain gas-works and supply gas in the parishes of Headley, Kingsley, and Selborne, in the county of Southampton; the capital authorized being £8000, with power to borrow £2666. Then we come to the formation of the East Hants Gas Company for the purpose of acquiring the foregoing undertaking. This new Company was registered on April 28, 1910; and the Board of Trade gave their consent to the acquisition. The nominal capital of the Company is £30,000. The limits within which the Company are authorized to supply include the districts recently supplied by the Liphook Gas Company, Limited, and the Liss Gas Company, Limited. The former Company was registered in 1909 and the latter in 1910. The capital of the Liphook Company was £5000, the whole of which was issued, and £4917 10s. was paid up. The Company borrowed, in addition, £1100. The capital of the Liss Gas Company was £10,000, of which 375 £10 shares were issued, and in respect of which £3690 was paid up. The Company also borrowed £1105. Then came the acquisition by the East Hants Company of the Liphook and Liss Companies. Out of the capital of £30,000, the East Hants Company have expended £12,000 in acquiring the Woolmer and District Gas Company; £4900 in £10 shares and £1500 in cash in acquiring the undertaking of the Liphook Gas Company; and £3690 in shares and £1350 in cash in acquiring the Liss Gas Company—making the total capital expenditure £23,440. The Company are also carrying out further works which are estimated to cost £4000. Altogether, the Company have issued 2831 £10 shares. The promoters ask for authority to supply within the limits defined by them. The Haslemere Gas Company were, by their Order of 1905, authorized to supply gas in Bamshott; and there has been an agreement between that Company and the Liphook one by which the latter has been supplying gas in the parish. This parish is included in the area of supply. Now the present measure provides for reincorporation, and the raising, from all this promotion and amalgamation, of the Bordon and District Gas Company. The proposed capital is £40,000, divided into £28,310 representing the capital raised to date and called "original capital," and £11,690 additional capital. Borrowing powers to the extent of one-third of the issued capital are asked for. Sanction to create a special purposes fund is desired. The first Directors are to be Mr. Thomas Webbe, Mr. Edward H. Jellett, and Mr. Alexander Ritchie. The auditors are to be professional accountants. All necessary powers as to manufacture and supply are sought. The standard price is proposed at 5s., for gas of a standard quality of 14 candles, tested by the No. 2 burner. [*Parliamentary Agents: Messrs. Burchells.*]

The Brodsworth and District Gas Company, Limited, desire to be dissolved and reincorporated. The concern was incorporated in 1909 under the Companies Act, 1908, with a nominal capital of £15,000, the whole of which has been issued. The promoters seek additional capital, an extension of limits, and the vesting in the Company of the Askern Gaslight Company, Limited. The new Company will, the measure succeeding, be known as the Brodsworth and District Gas Company. The amount of capital asked for is £42,000, whereof £21,000 is to be called the original capital, the remaining moiety the additional capital. Of the additional capital, not more than £10,000, it is suggested, shall be raised as preference shares or stock. Borrowing powers are desired to the extent of the customary one-third part of the issued capital. The standard rates of dividend are placed at 10 per cent. on the original capital, 7 per cent. on the additional ordinary capital, and 6 per cent. on the preference capital. A special purposes fund is requested. The auditors are to be of professional standing. The limits of supply are specified. Provision is made for the purchase of the Askern Company's property; and, from one of the schedules, it is seen that the price is to be £6000, with interest at 5 per cent. on this sum from Dec. 1, 1911, to the date of completion of, and the costs and expenses of and incident to, the purchase. The Brodsworth Company are also to pay and discharge all debts and pecuniary liabilities of the Askern Company as on the date of the completion of the purchase. The purchase price may be in shares or cash, or partly in one form and partly in the other, as agreed upon. The standard price of gas is suggested at 3s. 6d., with the sliding-scale operating on the usual terms. As in the case of the Bawtry Company, the Company in the prepayment meter clause are asking for the right to an excess charge of 8d. for meter without fittings. The standard illuminating power is placed at 14 candles, tested by the No. 2 burner. A stand-by clause applicable to both private gas plants and electricity is included. [*Parliamentary Agents: Messrs. Torr and Co.*]

The Fleetwood Gas Company were originally incorporated in 1872; and Provisional Orders were obtained in 1873 and 1884. By the first Order, authorization to supply in Fleetwood and part of the parish of Poulton-le-Fylde was accorded. The share capital at present consists of £10,000, in £10 shares, entitled to a standard dividend at the rate of 8 per cent. per annum, and £18,000 in £10 shares entitled to a standard dividend of 7 per cent. In respect of the issue of shares, the Company have received premiums to the amount of £8401 15s. 7d. The borrowing authorization under the Order of 1884 was £5400; and sums have been borrowed amounting to £3700, entitled to interest at the rate of 4 per cent. per annum. The Company now desire to extend their operations, and to be invested with additional capital powers. The capital requirements are £71,200, of which £41,200 is in respect of the present ordinary capital, and is to be called the "ordinary stock;" while £30,000 is the amount of the additional capital, with the limit of £15,000 placed upon the issue in the shape of preference stock. Borrowing powers are asked for (including the £3700 already borrowed) to the amount of £5400 on the ordinary capital, and to the amount of one-third of the issued additional capital. The standard rate of dividend is to be 5 per cent. on the ordinary stock; and 5 per cent. is not to be exceeded in the case of the preference stock. Special purposes and reserve funds are provided for. Professional auditors are only to be appointed. The limits of supply are specified as the township and the urban district of Fleetwood. The standard price of gas is proposed at 4s. 2d.; and respecting the sliding-scale—operating on a half-yearly basis, with a standard dividend of 5 per cent.—the increment or decrement of dividend per 1d. change in price, is at the rate of 1s. 3d. per cent. The prepayment meter clause is, as in two other instances already mentioned, varied from the "model" by 8d. excess being quoted for meter without fittings. Tested by the No. 2 burner, the standard illuminating power is to be 14 candles. A stand-by clause applicable to both private gas plants and electricity supply is included. A clause is to give power to the Company to provide for superannuation and other allowances to officers and employees; and

authorization is desired to institute a profit-sharing scheme. [*Parliamentary Agents: Messrs. Torr and Co.*]

The Herne Bay Gas and Coke Company, Limited, have hitherto carried on their operations under various Provisional Orders, with the one exception that they are among the companies participating in the Joint Standard Burner Act of 1910. The capital powers under the Company's 1899 Order are exhausted. There is £16,000 of 10 per cent. original ordinary capital, and £19,160 of 7 per cent. additional capital, which, with £840 premiums, make £36,000. Then of loan capital £9500 has been raised. The ordinary capital powers under the 1903 Order (£33,000) have not been touched; and the unexhausted loan capital amounts to £13,500. But now, with the expansion of the gas business, the Company find it expedient to ask Parliament for new gas-works powers; and for the purpose of constructing further works, a piece of land is scheduled containing 10 acres, 1 rood, 4 perches. Turning to the clauses of the Bill, the first point that attracts notice is, under the section the side-heading of which is "Incorporation of Acts," this modification of section 7 of the Gas-Works Clauses Act, 1847:

Any tunnel, arch, vault, or building situate beneath the surface of any street within the limits of the Company for the supply of gas shall for the purposes of the recited Orders and of this Act be deemed to be a tunnel to which the provisions with respect to the breaking up of streets for the purpose of laying pipes apply, and shall not be deemed to be a building within the meaning of section 7 [Not to Enter on Private Land without Consent.]

The Company desire that their existing capital powers shall be extended by £10,000, provided that the authorized share capital shall not exceed in the whole £79,000. The ordinary additional capital is to be entitled to a standard dividend of 7 per cent.; and the preference capital to 5 per cent. Authorization as to borrowing powers is on the customary one-third basis. In this connection, it is noticed that the Company are asking for the repeal of the limit (in the 1899 and 1903 Orders) of interest on borrowed money. Sanction as to the creation of special purposes and reserve funds is sought. It is proposed that, from Dec. 31 next, the standard price of gas shall be 3s. 9d. per 1000 cubic feet, with the sliding-scale operating on the usual lines, modified to half-yearly application. Land and works clauses, and those that succeed, are of the customary form. A stand-by clause, applicable to private gas plants and electricity supply, is inserted in the measure. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The Woking District Gas Company, Limited, were in the year 1890 incorporated under the Companies Acts. Provisional Orders were obtained in 1891, 1901, and 1907. Under these the total authorized capital amounts to £66,000, of which £61,210 has been issued, leaving £4790 still unissued. On mortgage, the Company have borrowed in the whole £8990; and there remains £7510 which the Company are empowered to borrow. In parts of the district supplied with gas by the Company, the Woking Water and Gas Company have powers of gas supply which they have not exercised; and the promoters now desire that the gas powers in such area of the Water and Gas Company should be extinguished. Within the proposed limits of supply are Chobham and Bisley. These places are included in the statutory boundaries of the Ascot District Gas and Electricity Company, who, however, have not supplied them. The promoters also desire the repeal of these powers of the Ascot Company. Capital and land powers are required by the Company. It is proposed that the capital shall be £105,000, of which £59,785 is to be called the original capital, and £45,215 the additional capital. The manner in which the original capital is to be divided between the present holders is set forth at length. The standard dividend proposed on the "A" ordinary stock is 10 per cent., on the "B" ordinary stock (including the additional "B" ordinary stock) 7 per cent., and on the preference stock 5 per cent. There is this provision attached—

If in any year, or, in the case of an interim dividend being declared, if in any half year in respect of which the same is declared, the funds of the Company applicable to the payment of dividends on the ordinary capital shall be insufficient to pay dividends at the respective standard rates on the "A" ordinary stock and the "B" ordinary stock, such funds shall be applied, in the first place, in the payment of dividend at an equal rate on both the "A" ordinary stock and the "B" ordinary stock until there shall have been paid a dividend not exceeding 7 per cent. on both such "A" ordinary stock and "B" ordinary stock, and then in payment of a further dividend upon the "A" ordinary stock: Provided always that the provisions of this subsection shall cease to operate so soon as the Company shall have once paid dividends at the respective standard rates on the respective amounts of the "A" ordinary stock and the "B" ordinary stock for the time being actually paid up.

Subject as is hereinbefore in this section provided if in any year, or in the case of an interim dividend being declared, if in any half year in respect of which the same is declared, the funds of the Company applicable to dividend on the ordinary capital shall be insufficient to pay the full amount of dividend at the standard rate on the "A" ordinary stock and the "B" ordinary stock, a proportionate reduction shall be made in the dividend on each such class of stock.

Reserve and special purposes funds are provided for. The Company ask for authority to borrow up to one-third of the issued capital, including £8990 already borrowed. Professional auditors are to be appointed. Land is scheduled for gas-works purposes. Clauses are inserted for the construction of plant for the handling of coal and other goods in connection with the Basingstoke Canal Navigation; and power to enter into agreements with the Navigation is asked for. Authorization to take and use water from the Canal Navigation is also sought. Protection is given to the London and South-Western Railway Company; and likewise to the Woking Water and Gas Company. The clause specifying the limits of the area of supply is accompanied by one extinguishing the right to supply gas by the Woking Water and Gas Company in certain parishes embraced in the now defined area, and repealing the right of the Ascot Company to supply in Chobham and Bisley. The standard price of gas in Woking, Horsell, Send, Ripley, Pyrford, and within so much of the parish of Byfleet as is within the limits of supply (called the "inner" area), is proposed at 5s. per 1000 cubic feet; the sliding-scale being on the ordinary terms in respect of any half year. In the "outer" area, the Company ask for power to charge a higher price than in the "inner" area, but not exceeding an additional 1s. In the "outer" area, the Company also desire to be allowed to charge different prices. The standard illuminating power of the gas is placed at 14 candles, tested by the No. 2 burner. A stand-by clause having relation to both gas and electricity is included in the measure. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

COAL PRODUCTION OF THE WORLD.

Board of Trade Statistics.

Some particulars were given a fortnight ago with regard to the output of coal in the United Kingdom during the year 1910; and now the Blue-Book from which this information was derived has been followed by what are known as the "Coal Tables"—a parliamentary paper, issued by the Board of Trade, and bearing the signature of Mr. G. S. Barnes. This document—which also deals, in the case of most of the tables, with the year 1910—contains a large number of statistics relating to the production, consumption, and imports and exports of coal in the British Empire and the principal foreign countries, together with statements showing the production of lignite and petroleum in the principal producing countries. There are twenty-four tables which have reference to ordinary coal (including two which set forth particulars as to the quantities of coal used in gas manufacture and in the production of pig iron in the United Kingdom), and four that relate to lignite and petroleum; and in addition to the production and consumption of coal, figures are given as to values, the number of persons employed, &c. Quantities are expressed throughout in terms of the English ton—2240 lbs. The 1910 figures are, it is pointed out, mostly provisional, and therefore subject to correction.

The total known coal production of the world in 1910 (exclusive of brown coal or lignite) was about 1,035,000,000 tons, of which the United Kingdom produced more than one-fourth. Going back to 1907, we find the amount was stated as 1,000,000,000 tons, and for the year before that 905,000,000 tons. The United States, the United Kingdom, Germany, France, and Belgium are the five principal coal-producing countries; and each had a larger output in 1910 than in 1909. In fact, with the exception of the United Kingdom, the production in 1910 exceeded that of any previous year; the aggregate output being 923,000,000 tons, or an increase of 42,000,000 tons on the figure for 1909, and of 27,000,000 tons on that of 1907, when the highest previous total was reached. Except in the cases of the United States and Germany, however, the increases last year were but small. The figures for the past three years are as follows: United Kingdom—1908, 261,529,000 tons; 1909, 263,774,000 tons; 1910, 264,433,000 tons. Germany—1908, 145,298,000 tons; 1909, 146,397,000 tons; 1910, 150,372,000 tons (provisional). France—1908, 36,044,000 tons; 1909, 36,519,000 tons; 1910, 37,254,000 tons. Belgium—1908, 23,179,000 tons; 1909, 23,140,000 tons; 1910, 23,532,000 tons. United States—1908, 371,288,000 tons; 1909, 411,432,000 tons; 1910, 447,837,000 tons (provisional). Of the remaining countries included in the tables, Russia alone has a production exceeding 20,000,000 tons.

In spite of the fact that the production of coal in the United States last year exceeded that of the United Kingdom by nearly 70 per cent., when compared with the population the output of this country still surpasses that of the United States. To be precise, the production in the United Kingdom amounts to nearly 6 tons per head; while in the United States it is under 5 tons. The output per head in Belgium is $3\frac{1}{4}$ tons; in Germany, about $2\frac{1}{3}$ tons; in France, less than 1 ton. In respect to the number of persons employed in the coal-mining industry, too, this country is far ahead of any other. In 1909, the number of persons employed in coal mining, above and below ground, in each of the principal producing countries was as follows: United Kingdom, 992,300; United States, 666,600; Germany, 613,200; France, 187,200; Belgium, 143,000. The fact is, however, emphasized in the report that, in drawing any conclusions from a comparison of these figures one with another, and with the output of the several countries, it must be borne in mind that they include varying proportions of persons engaged in the actual work of getting coal and in other work connected with the mines, and that the regularity of employment of those included in the totals of employed is not the same in all countries. With regard to the output per person employed, the United States in 1909 took the first place with 617 tons, and the United Kingdom second position with 266 tons. They were followed by Germany with 239 tons per person, France with 195 tons, and Belgium with 162 tons.

It is stated that the variations in the average value of coal at the pit's mouth in the United States have been comparatively

small in recent years. In the principal European countries, however, the largely increased output of 1907 was accompanied by a considerable rise in the average value per ton, followed in the cases of Germany and France by further increases in 1908, but by some falling-off in the United Kingdom and in Belgium. In 1909, a reduction in the average value of the coal raised was shown in all four of these countries; while in 1910 there was a rise of 1½d. per ton in the United Kingdom and of 2d. in Belgium, and a fall of 2¾d. per ton in Germany, as compared with the previous year. The values per ton at the collieries for the five leading countries in the last four years are given as follows: United Kingdom—1907, 9s.; 1908, 8s. 11d.; 1909, 8s. 0¾d.; 1910, 8s. 2¼d. Germany—1907, 9s. 8¾d.; 1908, 10s. 3½d.; 1909, 10s. 2½d.; 1910, 9s. 11¾d. (provisional). France—1907, 12s. 3d.; 1908, 12s. 11¾d.; 1909, 12s. 5½d.; 1910 (unstated). Belgium—1907, 13s. 8½d.; 1908, 13s. 1½d.; 1909, 11s. 8¼d.; 1910, 11s. 10¼d. United States—1907, 5s. 11½d.; 1908, 5s. 11¾d.; 1909, 5s. 7½d.; 1910, 5s. 10¼d. (provisional). It must be remembered, when comparing the figures for different countries, or for different years in the same country, that the average values shown are not for coal of the same quality. For instance, the figures for the United States are affected by the variations of the proportions of anthracite and bituminous coal in the total output, as well as by the changes in the value of each variety of coal. Then, in addition to differences in quality, average values are influenced by differences in the accessibility of the seams, in methods of operation, in the cost of labour, &c.

Taking the principal parts of the British Empire, it is seen that in two cases the annual output of coal exceeds 10,000,000 tons; and in all instances the production in 1910 was larger than that of 1909. The output in British India was 12,047,000 tons in 1910, and 11,870,000 tons in 1909; in the Commonwealth of Australia, 9,759,000 tons (provisional) in 1910, and 8,186,000 tons in 1909; in New Zealand, 2,197,000 tons (provisional) in 1910, and 1,911,000 tons in 1909; in Canada, 11,425,000 tons (provisional) in 1910, and 9,376,000 tons in 1909; and in the Union of South Africa, 6,436,000 tons (provisional) in 1910, and 5,534,000 tons in 1909. Last year's figures for Canada, New Zealand, and South Africa were larger than those recorded on any previous occasion; while the outputs in India and Australia have only been exceeded once before. In Australia, the production during 1910 amounted to about 2⅛ tons per head of the population, in New Zealand to nearly 2⅛ tons, in Canada to 1⅜ tons, and in the self-governing Colonies of South Africa to over 1 ton. The average value per ton at the pit's mouth of the coal raised in the different parts of the Empire for the past three years is as follows: British India—1908, 5s. 3d.; 1909, 4s. 8¼d.; 1910, 4s. 1d. Commonwealth of Australia—1908, 7s. 4½d.; 1909, 7s. 6½d.; 1910, 7s. 6¾d. (provisional). New Zealand—1908, 10s. 4½d.; 1909, 10s. 10½d.; 1910, 11s. 1½d. (provisional). Canada—1908, 10s. 8d.; 1909, 10s. 10½d.; 1910, 10s. 8¾d. (provisional). Union of South Africa—1908, 7s. 2d.; 1909, 6s. 3½d.; 1910, 5s. 10d. (provisional). In British India, South Africa, and the Australian Commonwealth the average value of coal produced was lower, and in New Zealand and Canada higher, in each of the years than in this country. The average values in Australia and New Zealand rose in 1909, compared with 1908, by 2d. and 6d. per ton respectively; and still further increases are shown by the provisional figures for 1910. In Canada there was a rise to the extent of 2½d. per ton in 1909, followed by a fall of 1¾d. in 1910; while in India and South Africa the average values fell respectively by 6¾d. and 10½d. per ton in 1909, and again by 7¼d. and 5½d. in 1910.

Turning now to another portion of the statistics, it may be pointed out that the foreign countries which export coal in excess of the amount they import are Germany, the United States, and Japan; while of the divisions of the British Empire included in the tables, the United Kingdom, the Commonwealth of Australia, the Union of South Africa, British India, and New Zealand fall within the same category. The excess of exports over imports in these cases, for 1910, was as follows: United Kingdom, 84,494,000 tons; Germany, 20,146,000 tons; United States, 13,022,000 tons; Japan, 2,590,000 tons; Commonwealth of Australia, 2,522,000 tons; Union of South Africa, 1,247,000 tons; British India, 546,000 tons; New Zealand, 45,000 tons. The exports from the United Kingdom last year were less than in 1909 by nearly 1,500,000 tons, and were also lower than in any of the three preceding years; while the exports from Germany still continue to expand—the figures for 1910 exceeding those for 1909 by 2,333,000 tons, and those for 1905 by over 9,000,000 tons. There was a falling off in the imports into Germany in 1910, so that the net exports increased by nearly 3,400,000 tons compared with 1909. Excluding coke, patent fuel, and bunker coal, the total quantity of coal exported from the United Kingdom during the year 1910 was 62,085,000 tons, as compared with 63,077,000 tons in 1909, 62,547,000 tons in 1908, and 63,601,000 tons in 1907; and it is remarked in the report that the comparative steadiness shown by the figures for these four years is in striking contrast with the large increases in the years immediately preceding them. The imports of coal into Germany in 1910 were 12,252,000 tons, about three-fourths of which were from the United Kingdom.

The principal coal-producing foreign countries which imported coal in excess of the amount they exported in 1910 were Russia, Sweden, France, Spain, Italy, Austria-Hungary, and Belgium. Of the divisions of the British Empire included in the tables, Canada alone had an excess of imports last year. The excess of imports over exports in each case was as follows: Russia, 4,779,000 tons; Sweden, 4,563,000 tons; Belgium, 318,000 tons; France, 17,607,000 tons; Spain, 2,467,000 tons; Italy, 9,117,000 tons; Austria-Hungary, 9,756,000 tons; Canada, 7,945,000 tons. The gross imports into all these countries, except Spain and Austria-Hungary, were greater in 1910 than in 1909; but the increases were mostly small. The question of the exports of coal from each country is, however, complicated by the fact that the published returns do not in all cases show the procedure with regard to bunker coal, which is only in some instances included.

For the purposes of the statistics, the consumption of coal in each country is arrived at by adding the imports to the home production, and deducting the exports, at the same time making allowance wherever possible for the re-exports. The total consumption of coal in the United States is now considerably more than twice as great as that in the United Kingdom, which has the next largest consumption; and during the last two years it was more than equal to the combined consumption of the United Kingdom, Germany, France, and Belgium. The chief coal-consuming countries in 1910, with the approximate amounts, were: United States, 434,815,000 tons; United Kingdom, 179,939,000 tons; Germany, 130,226,000 tons; France, 54,861,000 tons; Russia, 27,429,000 tons; Austria-Hungary, 24,590,000 tons; Belgium, 23,850,000 tons. The coal consumption in the United States is greater in proportion to the population also than in the United Kingdom; and Belgium and Germany are the only other foreign countries in which the consumption per head exceeds 2 tons a year. In France and Germany, of course, a great deal of other fuel is used. The consumption per head for different countries, in 1910, is given as follows; but most figures are provisional: United States, 4·72 tons; United Kingdom, 4·01 tons; Belgium, 3·17 tons; Germany, 2·01 tons; France, 1·4 tons; Austria-Hungary, 0·49 ton; Russia, 0·17 ton. In the United Kingdom, during 1910, 99·97 per cent. of the coal consumed was of native production; and in the United States, 99·48 per cent. In the case of Germany, 90·59 per cent. was native, 7·32 per cent. was British, and 2·09 per cent. came from other sources. In France, 64·89 per cent. was native, 15·39 per cent. British, and 19·72 per cent. was from other countries. As to Belgium, 69 per cent. was native, 7·03 per cent. British, and 23·97 per cent. came from other sources. Except for the United Kingdom and Belgium, however, these figures are provisional. The quantity of British coal imported into Germany for consumption in 1910 amounted to 9,500,000 tons. The average quantity of British coal consumed in Germany during the five years 1906-10 was 9,854,000 tons; while during the five years 1901-5 it was 5,759,000 tons. In the case of France, the imports of British coal amounted to 8,442,000 tons, which was less than in any of the preceding three years.

In 1909, the production of lignite in Germany was 67,554,000 tons, in Austria 25,625,000 tons, and in Hungary 7,536,000 tons. The provisional figures for 1910 show a production of 24,729,000 tons for Austria, 68,357,000 tons for Germany, and 7,610,000 tons for Hungary. The quantity of lignite produced in the United States is included in the coal figures. In no other country does the recorded output reach 1,000,000 tons a year. As to petroleum, the total production of the United States in 1910, according to the provisional figures, was 7,369,000,000 gallons, as compared with 6,372,000,000 gallons in 1909. The Baku and Groznyi oilfields of Russia yielded 2,254,000,000 gallons in 1909, which, though larger than for the four years immediately preceding, was still much less than in 1904, when it reached 2,749,000,000 gallons. The combined output of Germany, Austria, Roumania, Japan, Canada, British India, and the Dutch East Indies, in 1909, amounted to 1,708,000,000 gallons.

The total quantity of coal carbonized by gas undertakings in the United Kingdom in each year from 1905 to 1909 inclusive was:

Coal Used by Gas Undertakings in the United Kingdom.

—	1905.	1906.	1907.	1908.	1909.
	Tons.	Tons.	Tons.	Tons.	Tons.
Companies . . .	8,722,145	8,922,781	9,240,280	9,281,738	9,175,532
Local authorities*.	5,758,180	5,923,476	6,166,473	6,112,569	6,049,788
Total. . .	14,480,325	14,846,257	15,406,753	15,394,307	15,225,320

* Twelve months ended March of the years following those stated.

Lighting Inverted Incandescent Burners.—The following appeared in the "Manchester Guardian" last Thursday week: "The lighting of textile factories by compressed gas is now becoming common; and in some mills so lighted difficulty seems to be experienced in lighting-up by means of a safe appliance, on account of the position of the gas-mantle, which is usually inverted. The use of a really safe lamp for this purpose is an important matter, as many fires have undoubtedly been caused by the use of tapers and matches; and though there are a number of electrical appliances and several lamps burning vegetable oil, the use of which is practically free from danger, some of these do not seem to be always efficient, and others are apparently not well known. The possibility of injury to the mantle may prevent the use of some safety lamps, though a torch designed a few years ago for burning vegetable oil was provided with an attachment to guard against this danger. Some of the most effective lamps are, however, rather expensive; and it would seem that a really safe and usable lamp which could be placed on the market at a moderate cost would be widely appreciated."

RATIONAL GAS COOKING.

Uniform Heat Distribution in Gas-Ovens, and the Advantages of a Meat Roaster.

THE importance of a day load to gas undertakings cannot be over-estimated; for the more the output curve can be levelled over the twenty-four hours, the better. But an absolute level line is not so important to gas undertakings as to electricity generating-stations—in view of the cheap storage capability of the former, which enables them to safely tide over variable demand, and places them in an excellent position in the matter of stock to meet emergencies. This is one reason why the electricity generating-station will never be able to economically compete with gas undertakings for any extensive cooking load, quite apart from the large difference in the thermal values of gas and electricity and other considerations. Seeing that the highest peak of a gas undertaking's load is now, generally speaking, during the Sunday dinner hour, it is feared that an electricity undertaking would find such a short-time output very embarrassing at the low prices at which they are compelled to offer electricity for cooking purposes to enable them to make the cost of consumption figure out to something within moderation.

The day load is, however, of great importance to gas undertakings; and the gas-cooker is one of the best all-the-year-round contributors to this load. Therefore, the gas cooker business has to be protected, and that very jealously. The electrical people have commenced to attack it, and are pursuing their old course of abusing the well-established rival. The virtues of the gas-oven, according to electrical postulation, are few; its vices many. The gas-cooker is, they say, an inefficient, uneconomical, air-polluting, meat-poisoning invention; and the sooner it is superseded by the electric-oven the better. Vapour of the kind was sent freely into the air at the Olympia Exhibition, and again at the Manchester Smoke Abatement Exhibition; but the vapour soon expended itself against the huge bank of experience that the gas-oven has constructed throughout the length and breadth of the land. And the electrical people will find that any substantial footing in the cooking business will not be secured by the tactics of the charlatan, or merely by airy eloquence.

A Demonstration and its Lessons.

One of the assertions made by electrical cooking-stove makers is that a larger proportion of meat is wasted when roasted in a gas-oven than when roasted in an electric-oven. But details as to the foundation upon which such statements are made are carefully obscured from the sight of gas men. We are not surprised at this. The statement as to this waste, among other pieces of fiction, attracted the attention of Mr. R. G. Marks, of Southport, at the Manchester Exhibition. Mr. Marks is a working baker, and a teacher of his art, and as such he has made a special study of the gas-cooker. As a result, the faith that is in him in this regard is deep-rooted. He believes that gas cooking is the only satisfactory, economical, and cleanly method of cooking; and he does not hesitate to say that if, in the household, a greater use is made of gas for cooking, an economy will be effected that will render considerable help in lessening domestic expenditure. Mr. Marks is the inventor of a very simple and cheap heat-distributor for gas-ovens as well as a meat-roaster, to both of which more particular reference will be made presently.

It is perfectly evident that Mr. Marks ought to know what he is talking about when on a subject with which he has so much practical acquaintance. At the Manchester Exhibition, he challenged an electrical gentleman who was plastering flattery over the electrical cooker with a free hand; but the challenge was not accepted. Mr. Marks had, however, an opportunity at the exhibition of demonstrating that meat can be roasted economically in the gas-cooker, and without any of the disadvantages that electrical lecturers shower upon the cooker. At the demonstration, Mr. J. G. Newbigging was present; and he tells us that the following was the result:

		Lbs.	Oz.
Weight of raw meat			6
„ cooked meat	3 lbs. 10 oz.	4	
„ dripping	6 oz.		0
Loss			6 oz., or 8·57 per cent.

of original weight of meat. The consumption of gas was 24 cubic

The Patent Meat-Roaster for Gas-Ovens—Shown Open and Closed.

feet; and the gas-cooker used was one of Richmond and Co.'s, which they make for the Manchester Corporation Gas Department to its specification. Of course, the gas used for cooking the meat might have been utilized for cooking pastry or anything else at the same time as the meat; so that the experiment is no criterion as to how much food a given quantity of gas can cook, but simply as to the loss in weight of meat.

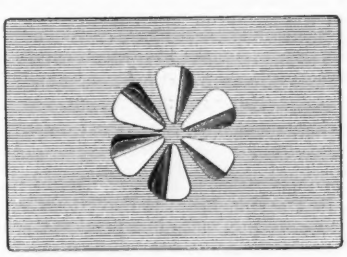
That is Mr. Newbigging's testimony. There are some additional and interesting details. The weight of the meat—it was a leg of lamb—was certified by the butcher's ticket. The gas used was measured by a prepayment meter; and though, using the joint-enclosing roaster, other things could have been baking in the oven at the same time, the consumption of gas represented in cost only a fraction of a penny. The joint was put in exactly at 3.39; and it was not looked at the whole time it was roasting. It was taken out of the oven at 4.37—the roasting having occupied 58 minutes. The joint being enclosed, the oven was perfectly clean, and there was no smell from burning grease. With regard to the loss in the weight of meat by evaporation, it will be remarked that it was less than 2 oz. per lb. of raw meat.

Uniform Heat Distribution in Oven.

So much for an actual public demonstration on the point of the waste of meat. The fact that one of Mr. Marks's patent roasters was employed in the demonstration invests both that and his heat-distributor with interest. Both devices appear to be better known in the North of England than in the more southern parts; and it is somewhat surprising to learn, from the Gas Heat Distributor Company (of No. 6, Blair Grove, Southport), that, of the heat-distributors alone, some 20,000 have been sold; and, including minor orders, the total may be put roundly at 25,000. The object that Mr. Marks had in devising the heat-distributor was to secure a uniform heat in gas-ovens. He claims that, with the heat from the gas-jets running up the sides of the oven, there is not the central heating that is requisite for full economy and efficiency. That is the object of the distributor—to ensure that there is a larger proportion of the heat brought into the centre of the oven. The distributor is in the form of a plate, with central apertures; and this is placed (after the jets have been alight for a few minutes to generally heat up the oven), plain side upwards, on the runner next below that on which the articles are standing which are being cooked. It is claimed that by this device the central heat is more than doubled. The distributors are made in all sizes, and are sold at low prices.

The Meat-Roaster.

With a central distribution of heat in the oven and a meat-roaster, it seems the conditions must be excellent for ensuring a good utilization of the available heat, and absolute cleanliness within the oven. The patent "roaster" is illustrated. It is almost in the form of a pair of metal dishes, the top one of which is inverted over the bottom one; thus forming (as it were) a box in



The Heat-Distributor.

which the meat is enclosed. The roaster has an outer bottom which prevents the gravy being burnt. It has been mentioned that, in the Manchester experiment, the "roaster" was not opened during the time the cooking was in progress. The explanation given for this is that the joint being enclosed in this way, it is self-basting; and there is small shrinkage in weight through the prevention of evaporation. The flavour and the nutritive qualities of the meat are retained. There is no smell from burning fat. These are the points submitted as capable of proof by Mr. Marks; and they cover the whole gamut of advantages that are hoisted high for the attraction of householders to the more expensive and

less efficient electric cooking. It should be mentioned that, when the roaster is being used, the retention within the device of all moisture evaporated in the cooking enables pastry and other articles of food to be baked simultaneously—thus effecting further working economy. The roasters are made in various sizes, and are priced at reasonable figures. In Mr. Marks's opinion, once used in gas-ovens they will always be used. In fact, during the past two years and two months, he has, in his own house, had a Richmond "Model" cooker in use, without a fixed outlet; and he assures us that, employing his devices, there has never been any smell when roasting or baking, and the oven is as free from grease as it was the first day it was fixed, and has not required washing out. During the period named, the oven has had extensive use. There have been baked in it 1300 loaves of bread, 212 joints of meat (aggregate weight 670 lbs.), 68 rice puddings, 219 Yorkshire puddings, 123 current cakes, 104 apple pies, and a number of other articles of food.

Gas Engineers' Experiences.

Several gas undertakings northward have adopted the appliances in question; and two gas engineers and managers have kindly complied with a request that we made direct to them for their experience.

Mr. H. Townsend, of Wakefield, supplies us with his views, as follows:

In reply to your letter, I may say that we have been using Mr. Marks' patent heat distributor and his Bakewell patent roaster for about a couple of years, and are convinced of the efficiency of both appliances. We give a heat distributor free with every cooker fixed; and since we have done so, cooking by means of gas has certainly become more popular in our district.

A firm of sponge cake specialists have been giving demonstrations at a shop which they have hired in the city during the past fortnight; and I called recently, and asked the two lady demonstrators how they like the heat distributors supplied with the two cookers they are using. They both said they considered them a great improvement, as they could now brown their sponge cakes at the top as well as at the bottom, which they had never hitherto been able to do. They had been giving demonstrations all over England, but had never seen one of these heat distributors before they came to Wakefield; and they liked them very much.

With respect to the Bakewell patent roaster, we often find, when we send men to fix gas-cookers, that there is no suitable chimney or flue available to take away the products of combustion; or if there is one, it is troubled with a down-draught. We have consequently had to conduct a number of flues into the open air where there has been no chimney; and in the other cases to adopt some device to prevent the down-draught. These expedients have seldom been successful. For the past two years in cases of this sort, we have supplied one of the roasters free, instead of a flue-pipe. We fix cookers free; and we find the average flue-pipe costs about the same amount as a roaster. We are satisfied that meat or poultry cooked in the roaster is equal in flavour to that cooked by any other method—in fact, one is regularly used in our own home, while the roaster keeps the cooker free from grease. The roasters are also much appreciated by our consumers—in fact, we have had a boom in cookers since adopting the two devices.

In a letter received from a gas manager also in the North, writing on the subject of his experience, we read:

Some time since, I arranged for some demonstrations and lectures on baking and meat roasting, with a gentleman who had been strongly recommended to me. Although I had decided to test his methods, I candidly admit that I felt sceptical as to the results, because I was told the demonstrator's methods were entirely different from any others, and, in fact, they were not what the gas-stove makers had all along advised. At the very first lecture, from the way this gentleman handled the gas-oven, I was fully convinced he was on the right lines; for he could, and did, bake and roast many things in the oven at one time. He delivered lectures for a week, using a new gas-oven.

Though meat was roasted every day, the gas-oven was entirely free from smell and grease. This sort of teaching saves the user time and work—no gas-oven to scrub out. I, there and then, adopted his patent gas-oven heat-distributor for all fixed stoves. I also supplied to each consumer his card of instructions, explaining how the gas-oven should be used. My consumers have much appreciated this; and I have experienced an enlargement of the day load.

Northern Adoption.

In commencing this article, we spoke of the importance of not only encouraging, but protecting, the day load. Quite recently it was pointed out in our editorial columns, when speaking of how the day load in some places had reached 50 per cent. of the total consumption, that at Blackpool the day load was now heavier than the night load. In a place like Blackpool, a large amount of the day load must be due to consumption for cooking; and in this connection Mr. Marks informs us that something like 5000 of his heat distributors for gas-ovens have been sold in the popular north-western seaside resort. From a recently compiled list of some of the principal towns in which the gas-oven heat-distributor has been adopted, we take further figures, which, however, are not quite up-to-date: Southport, 2500; Accrington, 2000; Huddersfield, 2000; Manchester, 1200; Burnley, 1200; Wakefield, 1000; Nelson, 1000; Liverpool, 1000; Colne, 800; Wigan, 400; Darwen, 300; Great Harwood, 500; Rochdale, 800; Leigh, 300; Halifax, 400; Todmorden, 400; New Brighton, 500; Clayton-le-Moors, 300; Barnoldswick, 300; Morecambe, 400; Hereford, 300; Lancaster, 300; Douglas, 600; Barrow-in-Furness, 200.

The Value of Efficiency.

These figures, and a collection of some 150 original testimonials from users that we have had an opportunity of reading, form a substantial and broadly scattered manifestation of satisfaction with gas-ovens supplied with the devices patented by Mr. Marks; and he suggests that, if these appliances were more freely known and used, the use of gas-stoves would become even more popular, through an increased economy and efficiency, than they are to-day. There is no doubt about it that there is a large amount of ignorance as to the proper use of gas-stoves; and this ignorance has to be combated. There is no question, too, that in many households the utmost efficiency is not got out of gas-stoves that might be obtained. The devices before us are intended to, and the large testimony assures us that they do, improve both the economy and working efficiency of the gas-oven; and this improvement must enhance satisfaction. There are about 2 million gas cooking stoves fixed in this country to-day; and with all these stoves giving satisfaction, the gas industry has a branch of business of imposing dimensions. That being so, welcome is given to any device that contributes to increased satisfaction in the use of the gas-oven.

A GERMAN GAS MANUAL.*

The little German manual of eighty-six pages, on gas manufacture and modern gas lighting, which is before us, forms one of a series of scientific handbooks emanating from the well-known publishing house of Vieweg and Son, of Brunswick. After a short introduction, there is a section on the development of gas lighting, relating more particularly to Germany since the year 1825, when the first gas-works in the country were built in Hanover by the Imperial Continental Gas Association. An interesting tabular statement gives the output of gas in the principal towns of Prussia in 1907 and twelve years earlier. It appears from it that the make of gas has approximately doubled in that period.

The ensuing section treats of the manufacture of coal gas, and contains illustrations and a detailed description of settings of inclined retorts; while horizontal retorts are referred to, and settings of Dessau vertical retorts are briefly described. Then follows a short account of the remaining items of gas manufacturing plant. The next section deals at greater length with the nature of coal gas. There is an unfortunate slip, on p. 12 of the manual, where the author speaks of coal gas having a calorific power of about 5000 calories per kilogramme, instead of per cubic metre. But otherwise his data, generally speaking, are well chosen and correct. He might with advantage, however, have described the modern pattern of the Junkers calorimeter, in which the inlet and outlet water thermometers are placed at the same level, instead of the old pattern in which their levels differed by some 18 inches.

The use of illuminating gas is illustrated by descriptions of typical upright and inverted incandescent burners; and their duty is compared with metallic filament electric lamps on the basis of Berlin prices for gas and current—viz., 3s. 6d. per 1000 cubic feet, and $4\frac{3}{4}$d. per unit. It is shown that at these prices light from an Osram lamp is four times as costly as light from an inverted gas-burner.

Distance lighters are briefly mentioned; and then high-pressure gas lighting is dealt with much more fully than would be expected in a book of this size. Among the systems described are the Millennium, Pharos, and Keith high-pressure gas, the Pharos compressed air, and the Selas compressed mixed air and gas systems, including both compressing plant and burners. Evidently the author has had special acquaintance with this branch of his subject, and even experienced gas engineers may benefit by glancing through this part of the little volume.

The rest of the manual fulfils quite well its purpose, which is obviously to give an account of gas manufacture and gas lighting for the enlightenment of persons of a scientific or technical bent who do not happen to be directly concerned with the gas industry.

* "Die Wissenschaft, Heft 40. Die Leuchtgaserzeugung und die Moderne Gasbeleuchtung." Von Fritz Schmidt, Ingenieur in Berlin. Brunswick Friedrich Vieweg und Sohn; 1911.

Glover-West Vertical Retorts for Heywood.—The Heywood Town Council (meeting in General Purposes Committee) last Wednesday approved of a scheme for the reconstruction of the carbonizing plant at the gas-works. The proposals, which will necessitate an expenditure of about £9000, include an installation of Glover-West vertical retorts. Mr. W. Whatmough, the Gas Engineer, had prepared for the information of the Gas Committee and the Council an elaborate report on the subject.

Patents in the Past Year.—Messrs. Stanley, Popplewell, and Co. say that the total number of applications for patents last year was 29,400—a decrease of 988 compared with the number filed in 1910, which itself was lower than the aggregate for 1909. They say it is somewhat difficult to explain the precise reason of this falling-off. The Patent Act of Mr. Lloyd George, with its stringent requirements as to the actual working of the patented invention in this country, seems no longer to have a deterrent effect on foreign inventors. The re-enacted provisions of the previous Act, however, which have been in force for eight years, are still effective in checking the issue of invalid patents, or materially limiting the scope of those which are eventually granted.

THE APPLICATION OF BLUE WATER GAS TO INDUSTRIAL PROCESSES.

By Alwyne Meade, Assoc.M.Inst.C.E., F.C.S. (Miller Prizeman of the Institution of Civil Engineers, 1911).

Gas engineers in general, though thoroughly conversant with the manufacture and production of blue water gas, have seldom any knowledge of the uses to which it is put when once it has left the manufacturing plant; and probably few realize the extent to which this gas is now made use of commercially. Up to the present, blue water gas has not made a great deal of progress in this country; but the influence of the Continent is by degrees getting felt, and shipbuilders, cutlers, glass makers, and motor manufacturers are gradually awakening to both its convenience and its cheapness.

In Holland, as also in Germany, the industrial processes for which water gas is used are innumerable; and in many cases the works have their own generating plant, or, in the case of works being close together, they can all be supplied from one large central plant. The advantage of this is obvious; for, up to certain limits, the labour entailed is exactly the same whether the plant is large or small. The day has yet to come when gas companies in this country will find it profitable to manufacture blue gas from a separate unit, and supply it in special mains to the factories in the district; for, although a number of blue-gas plants are now to be found in gas-works, they are there only for the convenience of increasing the daily output of illuminating gas, or for reducing the candle power of the coal gas when this is desirable.

It is not necessary to describe here the ordinary methods of producing blue water gas, with which all gas engineers are familiar; but it will be as well to recall briefly its constituents and properties, and to compare it with one of its most persistent rivals—namely, suction gas.

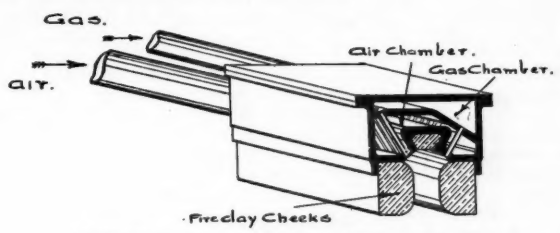
	Blue Water Gas.		Suction Gas.
Hydrogen	52 0 per cent.	..	16·0 per cent.
Carbonic oxide	39·0 ,,	..	33·0 ,,
Carbonic acid	4 5 ,,	..	3 0 ,,
Nitrogen	3·5 ,,	..	48·0 ,,
Methane	1 0 ,,	..	*nil*
Calorific power (net)	280 B.Th.U.	..	135 B.Th.U.
Fuel used per 1000 cubic feet	34 lbs.	..	25 lbs.
Cost per 1000 cubic feet	4½d.	..	2⅜d.
Thermal efficiency	25·9 per cent.	..	22 1 per cent.
Gas required per B.H.P.	35 cubic feet	..	85 cubic feet
Approximate cost per B.H.P. hour	0·157d.	..	0·233d.

It will be noticed that the calorific power of blue gas is more than double that of suction gas; and the approximate cost per B.H.P. hour is considerably lower in the former case. The figure of 4½d. given for blue gas includes all charges, and also depreciation and interest on capital. This is an average figure for a medium-sized plant; and it should be stated that it may be reduced to about 3½d. in the case of the very large plants.

By far the most important property of blue gas is its exceedingly high flame temperature; and Dr. Roessler has found that by admixture with heated air a temperature considerably above the melting point of platinum may be easily obtained. Under general conditions, however, the temperature of the hottest part of the flame is about 2800° to 3000° Fahr. It is owing to this property that blue gas is applicable to such processes as welding, forging, and heating furnaces.

In some cases, especially on gas-works, it is desirable to enrich the gas. This may be done by interposing a benzol carburettor between the generating plant and the relief holder, or the gas may be carburetted with ordinary coal-tar.

It is impossible to describe in a short article the innumerable processes to which water gas is now, and in the near future is likely to be, applied. The writer has selected for description the processes which he considers the most important and the most interesting to the general engineering profession. It is chiefly in connection with high temperature work that blue gas is used; and the processes may be divided up under two headings—those in which burners are employed, and those in which furnaces are made use of. By far the most important process is that of welding; and it is chiefly for this purpose that water gas has been adopted in some of the great workshops of the North of England. With its use, a steel main, 18 feet long and ½ inch thick, may be welded in about one hour. With hand welding, this would probably take from one to two days, or even longer, and would be from five to seven times more expensive.



A Welding Burner as Used with Blue Water Gas.

A typical welding burner is shown in the drawing. In the process of welding two of these are used—one inside the main and one outside, as seen in the photograph. The metal is thus quickly raised to the required heat, and a hydraulic press completes the work, after which each pipe is tested under a pressure of 700 lbs. per square inch. In burners of this description, the cheeks are made of fire-clay. The burners are in reality quite small; being 18 inches long by 8 inches wide and 9 inches deep over all. Each one consumes about 9000 cubic feet of water gas per hour. Thus, for gas alone, the cost for welding a pipe 18 feet in length would be about 6s. 6d. The air supply to the burner, which is not heated before admission, is maintained at a pressure of about 2½ lbs. per

A Roller Welding Machine Engaged in the Process of Welding by Means of Blue Water Gas.

square inch; and the gas reaches the burner at a pressure of about ½ lb. per square inch. The same burner may be used for welding and working a number of similar articles, such as boiler flues, tanks, and masts for ships.

As regards water-gas furnaces, it is only necessary to explain that they are built up of fire-brick, and fitted with a combustion chamber, and are very similar to the coke-furnaces which are used in ordinary retort-benches. They are chiefly employed for such processes as heating metal for drop forgings and stampings, also for the smelting of iron, steel, and brass. A new use to which blue gas is being put is that of heating furnaces for glassworks, and for "glory-holes;" the latter being the appliances with which the necks of bottles are shaped out. The temperature of the furnace may be easily regulated by admitting either more or less gas. Thus the same furnace can, if necessary, be used both for processes which require great heat, and for processes, such as annealing, in which only a moderate heat is required.

In all processes of the above kind, there is no necessity to purify the gas from sulphuretted hydrogen—merely an ordinary water-scrubber is used. It is, in fact, an advantage to leave the gas unpurified, for it then has a distinct smell, and any escape may be quickly perceived. Thus one of the greatest drawbacks to blue gas—its freedom from smell—is more or less overcome. It will be remembered that in Germany it has in some cases been thought advisable to impart a distinct odour to the gas, by passing it through a heavy hydrocarbon oil, such as mercaptan.

Power and Lighting.

No water gas is entirely suitable for use in gas-engines, owing to the very high percentage of hydrogen which it contains, and, consequently, its inability to stand high compression. However, practical experience has proved that, although it is not perfection, it answers quite well, and, as will be seen from the table given above, its heat efficiency is moderately high. When using blue gas for power, it is absolutely essential, if good results are to be obtained, to pass it through oxide of iron before use.

As regards the value of blue gas for both heating, lighting, and power, probably no results are so convincing as those achieved at Nottingham by Mr. J. H. Brown, and set forth in a paper read by him before the Institution of Gas Engineers in 1905. The paper speaks of a 40 H.P. gas-engine, driven with blue gas, which was in constant use; and tests spread over a considerable period showed that, compared with coal gas, the efficiency of water gas was 1·19, taking coal gas as unity. Moreover, the engine ran with perfect satisfaction.

With regard to lighting, Mr. Brown says that "blue gas can be used in incandescent burners with even more satisfactory results than can be obtained with coal gas; but care is necessary to select a mantle that exactly fits the flame." For some considerable time the laboratory at Nottingham was satisfactorily lighted by means of blue water gas alone. A practical disadvantage, which is not mentioned in the paper quoted, is the discoloration of the mantles. It is found in nearly all cases that when blue gas is used for lighting, the mantle quickly becomes coloured a deep yellow. This is undoubtedly due to some chemical combination between the gas and the material from which the service pipes or mains are made; but it may be overcome by allowing the gas to bubble through a seal of weak sulphuric acid before it is used. It is rather to be regretted that, in Mr. Brown's paper, although the virtues of blue gas are acclaimed, the defects—and surely there were defects—appear to receive but little mention.

A new process for which water gas may be employed, and one which will probably be largely developed in the future, is that of producing pure hydrogen. This is done by liquefying or freezing out all the other constituents—the hydrogen, which, of course, liquefies at a much lower temperature, being left behind.

Cement manufacturers are now making use of water gas, which is introduced into the revolving kiln for the finishing-off process, and it is also finding its way into the brick-making industry.

Balloonists have already awakened to the economy and utility of the gas, and no doubt the new method of producing hydrogen from it will be in high favour with them. The objection to coal gas for ballooning purposes is that the hydrocarbons are to a certain extent injurious to the fabric.

From the above remarks it may, perhaps, appear that the potentialities of blue water gas in industrial directions have been somewhat over-estimated; and the writer would point out that almost any process to which blue gas is applied may be carried out equally well with coal gas. In many ways the latter is superior and more convenient.

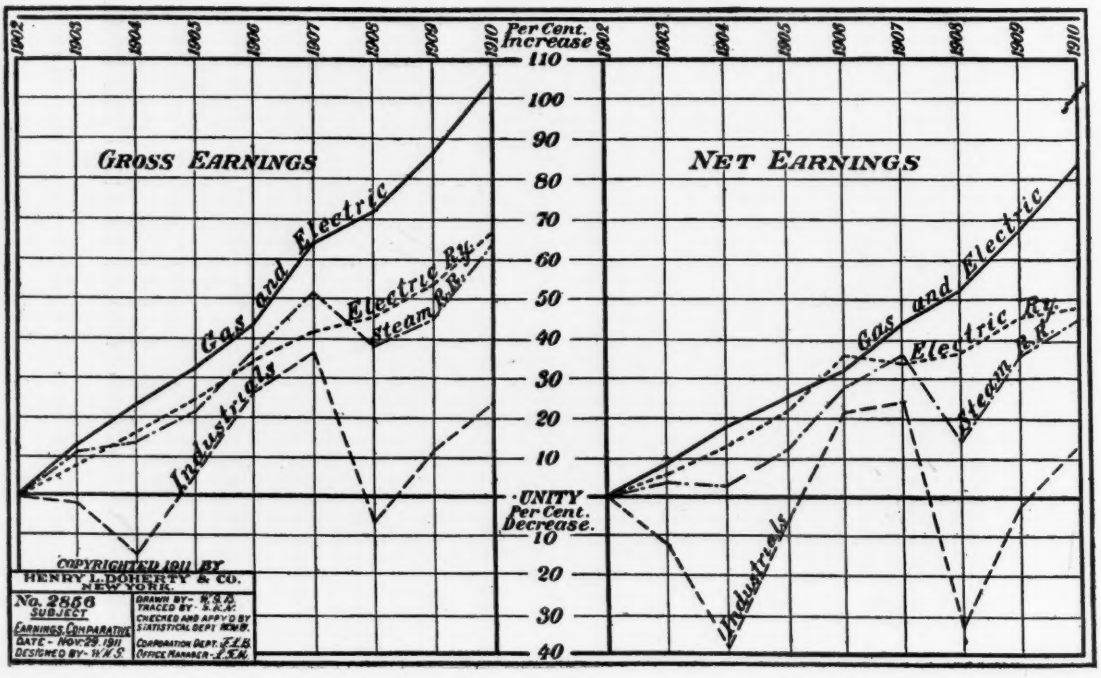
Coal gas will always find a ready and profitable customer in the owner of small or medium-sized works where the varying amount of work on hand necessitates frequent stopping and restarting. In such cases, it would be neither economical nor practicable to instal a water-gas plant. However, at the present day, economy is undoubtedly a primary consideration; and in the case of a large works, in which work is continually going on, there is little doubt that coal gas is decidedly more costly than blue gas. With reference to flame temperature, some authorities still maintain that the coal-gas flame is as hot as that of water gas; but practical experience seems to prove otherwise.

As regards the future of blue gas, there is no reason why its industrial applications should not be rapidly developed; and, under such conditions as stated above, it will probably at no very distant date take its place in the front rank among the more material rivals of coal gas.

EARNINGS OF GAS AND OTHER UNDERTAKINGS IN THE UNITED STATES.

We have received from Messrs. Henry L. Doherty and Co., of New York, the accompanying chart, showing the relative increases and decreases of the gross and net earnings of steam and electric railroads, gas and electricity companies, and industrial undertakings for each of the nine years from 1902 to 1910. Though the chart is based upon statistics relating to the United States, it is of sufficient general interest to justify reproduction.

In a statement accompanying the chart, Messrs. Doherty explain that the lines show for each year the percentage of increase or decrease in the gross and in the net earnings of properties in the four classes specified; all being based on the figures for the year 1902 as unity. In the preparation of the chart, the lines for steam railroads were derived from the combined gross and net earnings of all the roads of the United States. They deduced their "industrial" curve from the combined figures of such operating industrial undertakings as were listed on the New York Stock Exchange, and could be traced back to 1902. The magnitude and diversity of this group is evident from its having gross earnings of about $1,250,000,000 for the year named. The electric



railway and the gas and electric light curves were based on combinations of all figures obtainable without selection, and covering most of the larger cities of the country, excluding New York.

The curves show that the gross and net earnings from the gas and electric business increased the most rapidly, and that they were practically unaffected in their rate of increase even by such panic conditions as those of 1907 and 1908. It will be noticed that the gas and electric properties are the only ones which, during the entire period shown, did not experience a decrease for any year in net earnings; while the gas and electric and street railway properties are the only ones which did not show any decrease in gross earnings.

Messrs. Doherty consider that the absence of fluctuation in gas and electric earnings tends to explain the fact that, outside the large companies in New York and Chicago, there is little, if any, speculation in gas and electric securities, and that these are almost entirely purchased and held by those who desire permanent investments in safe and profitable enterprises. In all the lines, the gross earnings show a greater percentage of increase than that of the corresponding net earnings. This would seem to indicate, among other things, that the costs of materials or labour, or both, increased more rapidly than prices, in spite of the much greater volume of business done in 1910 than in 1902. This is regarded as particularly interesting, in view of the general downward trend of prices for gas and electric services during the last decade. It shows that they more and more find their net earnings in an ever-increasing volume of sales, with decreasing net profits per unit of sales—not in comparatively small sales and larger profits per unit.

THE "FOS" GAS FLASH-SIGN.

Gas *v.* electric light, or electric light *v.* gas—it amounts to the same. The struggle goes on; and the rivalry becomes every day keener. In a fair and square struggle, the gas man is well able to "hold his own" on all points excepting one—viz., the question of advertisement devices or illuminated signs. If we speak honestly, we must admit that our rival has in the past undoubtedly "scored" with his street flash-signs. It is, therefore, quite a pleasure to draw attention to the really excellent results obtained by the clever invention of the manufacturers of the "FOS" gas-flash sign—the Universal Light and Sign Company, Limited, of No. 44, Gray's Inn Road, whose Managing-Director is Mr. F. O. Seyd.

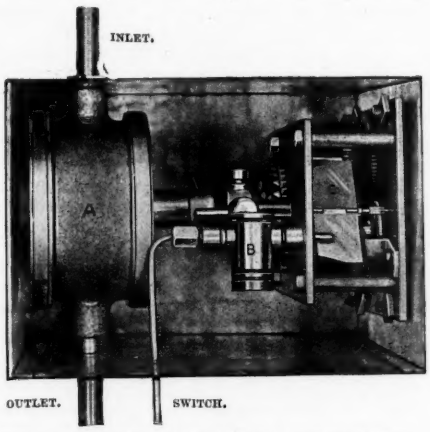


Fig. 1.—Mechanism of the "FOS" Gas Flash-Sign.

If the "FOS" signs go on as they have started, they cannot fail to become a "very sore place" to the electric sign. The flash obtained is quite equal to anything seen in electric light; and the "change-colour" and "spelling" or "letter-by-letter" effects are really excellent. To all intents and purposes, the "FOS" signs will produce all the effects of the electric flash-signs. The invention, which is patented in practically all gas-consuming countries, is extremely simple; and therein lies the secret of its success in working. There really seems nothing to get out of order.

The device consists of a very simple form of flash-valve, which is driven by a well-constructed clock-motor, that will run about eight to twelve hours at a winding, according to the speed at which it is regulated. The mechanism is mounted in a neat weather-proof iron case (see fig. 1); and any man with the slightest knowledge of gas work should have no trouble in fitting it to a sign or lamp. The gas enters the valve at the top without hindrance; but its exit (which is placed at the bottom of the valve) to the sign is controlled by a very simple form of trip-shutter, the action of which is surprisingly quick. There appears to be nothing at all which can possibly clog or stick or give trouble in any way—its action is certain for so long as the motor is working. The valve shown in fig. 1 is used for a simple flash—*i.e.*, a single gas service in which all lights on the service are intended to be "flashed" simultaneously. The flash can be regulated to act quickly or slowly; and the period of light or darkness can be long or short.

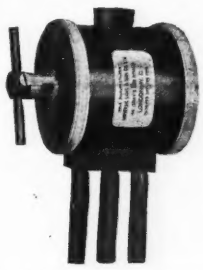


Fig. 2.—A Three-Way Valve.

For "change-colour" effects, a multiple-way valve is used, having only one inlet, but as many outlets as there are changes of colour—one service to each colour. In fig. 2 is shown a three-way valve, which will, of course, produce three distinct changes of colour. As the trip-shutters can be arranged to work in any sequence, it is obvious that it is possible to obtain a combina-

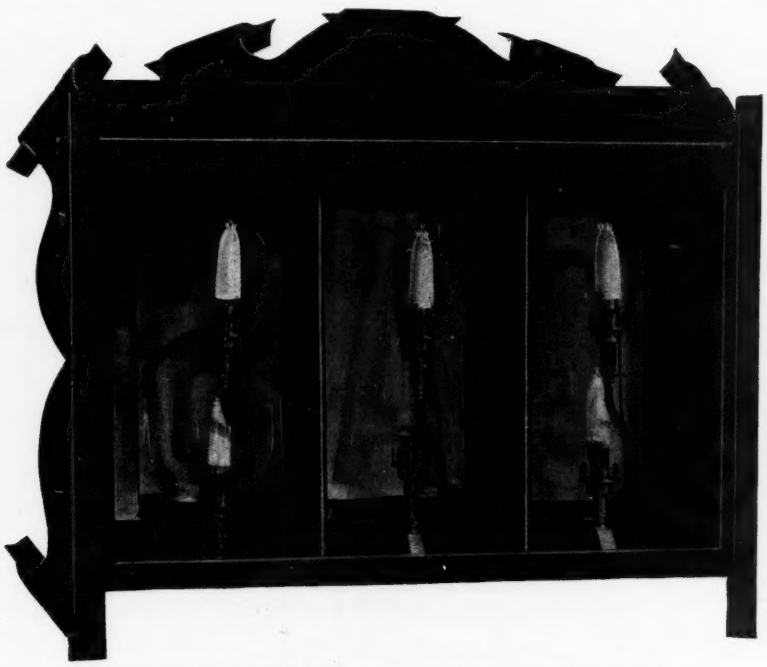


Fig. 3.—Interior of a Three-Way "Letter-by-Letter" "FOS" Flash-Sign.

tion of colours. For instance, if a two-way valve is used with one service supplied with blue chimneys to the burners and the other with orange chimneys, one can get really three distinct colours—blue, orange, and (by regulating the valve to actuate both shutters simultaneously) green. The effects to be obtained by a number of services seem to be almost unlimited; for it is simply a matter of ingenious fitting of the interior of the sign.

For "letter-by-letter" signs, it is, of course, necessary to have a separate outlet for each letter or word; the capacity of the inlet being supplied accordingly. There is a sign with the words "Gas Signs," producing the words letter-by-letter; and the effect obtained is more attractive than with an open bulb electric sign. The letters are 14 inches in height, and manufactured of hollow raised flashed opal glass; and the light is so well diffused as to make it impossible to detect the exact position of the burners behind. We all know that in the electric signs one can always put one's finger on the spot in front of the bulb; but in the gas-sign this is not the case, for the position of the burner cannot possibly be located. Fig. 3 shows the interior of a three-way "letter-by-letter" sign with 14-inch raised opal letters. These letters are particularly suited to outdoor work, as they are not affected by weather, and every shower of rain washes them.

The starting and stopping of the motor is arranged very simply. A pneumatic switch is attached as shown at B, fig. 1, which can be actuated at any distance up to 300 feet from the sign.

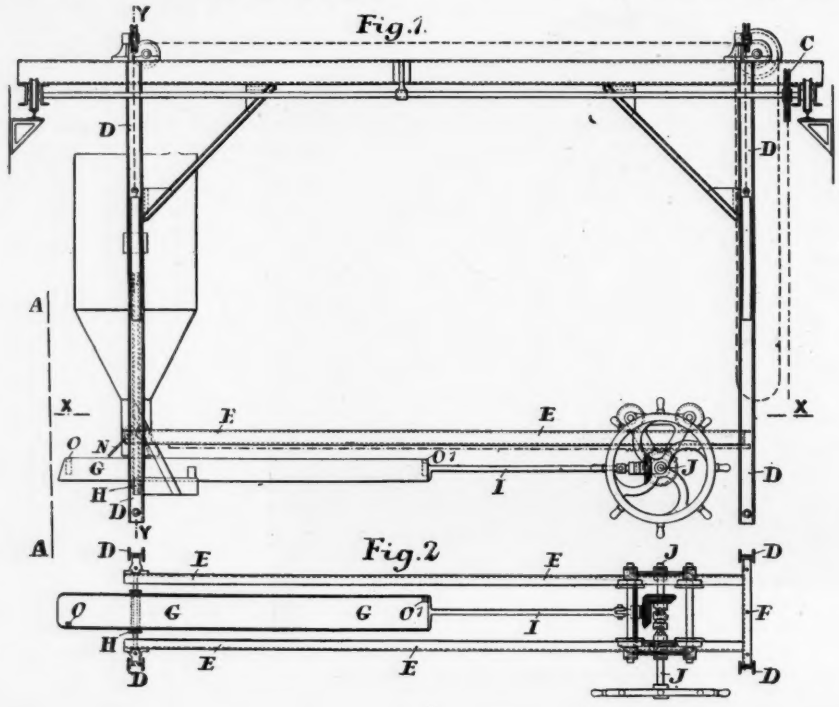
A very important point in sign work is the question of the cost of running; and here the "FOS" signs undoubtedly score. The gas consumed will, of course, vary greatly, according to the size of the sign; but a fair estimate may easily be arrived at if we reckon one incandescent "C" burner to every letter of the sign not exceeding 12 inches high. For instance, a 6-feet sign with the words "Gas Signs" in 1 foot letters would require eight "C" burners to illuminate the sign effectively. For "change-colour" effects, it is necessary to have a complete set of burners to each distinct colour; but it must be remembered that only one set of burners is illuminated at a time. It must also be borne in mind that the burners are flashing, and therefore the actual gas consumed by each burner would be little (if any) more than half the consumption of the same burner when illuminated continuously, as the periods of darkness have to be taken into calculation. As an example, it may be safely stated that, presuming the price of gas to be 2s. 8d. per 1000 cubic feet, the cost of running the above-mentioned 6-feet sign with eight 12-inch letters, would work out at about two hours a penny. It will therefore be seen that in most towns electric light cannot possibly compete with gas for sign work. It is necessary to fit not more than one-third the number of burners that one would have to fit for the same sign with electric bulbs. The question of economy need therefore not worry the gas undertaking. On comparing the costs of the "FOS" gas sign and the electric sign of the same size, it is seen that the gas sign is produced at an equally low or lower figure, though it is necessary that it should be made of infinitely better material, and there is much more work entailed in its manufacture. The gas sign must be more solidly constructed to withstand the heat; and it must, of course, be fitted with efficient ventilators.

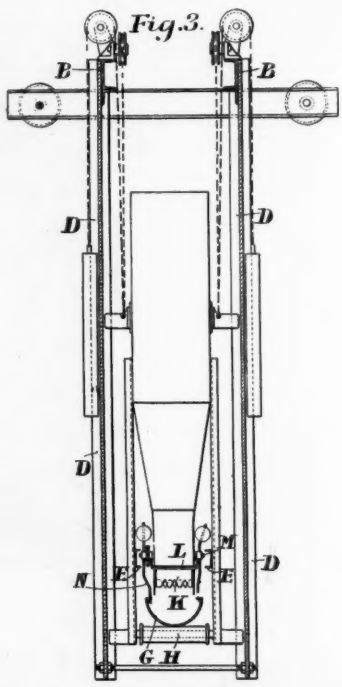
All these points seem to have been kept well in mind by the Universal Light and Sign Company in the production of their signs. Many gas managers have recently been adopting scenic advertisements in their show-rooms; and to these we can strongly recommend the adoption of the "FOS" flashing mechanism, as the addition would certainly enhance the effect. The question of advertising is one which managers are discussing more every day; and we cannot conceive any more effective or appropriate method of advertising gas than by the use of a practical gas sign.

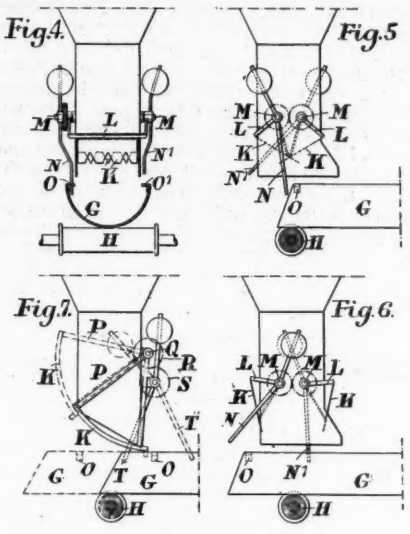
RETORT-CHARGING MACHINE FOR SMALL WORKS

The Compagnie Anonyme Continentale pour la Fabrication des Compteurs à Gaz et Autres Appareils, of Paris, have taken out a patent for a retort-charging machine which has been specially designed for use in small works where no electric power is available. Though, with the existing chargers, manual labour is dispensed with, the scoop has to be filled with a shovel, which necessitates the employment of men who know how to use it. The patentees claim that the present invention obviates this inconvenience, as the scoops are filled automatically, and raised to the proper height in front of the retorts. They have consequently only to be pushed in and turned over to be emptied. The following description of the machine is translated from the French specification; and the accompanying illustrations show its details. Fig. 1 is an elevation and fig. 2 a horizontal section on the line X of fig. 1. Fig. 3 is a transverse section, on a larger scale, on the line Y of the same figure. Fig. 4 (also on a larger scale) is an end view of the lower part of the skip for filling the scoop; the latter being shown in section, with the skip closed. Fig. 5 is a front view of the lower part of the skip, when closed; and fig. 6 a similar view, but with the skip open. Fig. 7 is a front view of another form of the lower part of the skip.

The machine consists of a movable crane running before the retort-settings, the front of which is indicated by the line A. The crane is formed of an upper framework B, the small sides of which support rollers resting on rails parallel to the settings. A longitudinal shaft unites two of the rollers, and carries a fly-wheel C, over which an endless chain runs to displace the crane, and bring it to a suitable place where the skip (to be described later) is filled with coal, or to move it along the front of the setting and fill the retorts. Perpendicular posts D run downwards from the upper platform, and are braced together below by bolted rods. These double T-iron posts serve as guides for a lower movable frame E, composed of two longitudinal bars, connected at the rear by a cross-piece, and held apart in front, as will be subsequently explained. The rear and front posts guide vertically both the frame E and the skip. At the back, guiding is effected by the extremities of the cross-piece, which run between the flanges of the double T-iron rear posts D, and in front by guides fixed to the longitudinal bars; the guides being engaged between the flanges of the front posts. The skip is furnished with lateral guides, which also engage with the flanges of the front posts. The frame E and the skip are balanced by four counterweights, the chains of which run over guide-pulleys. Upward movement of the frame and the skip is obtained by means of three chains—two at the top of the framework (also connected with the lateral guides of the skip), and the third F attached to the middle of







the cross-piece. The two chains run over guide-pulleys, then over two drums, and are gathered up in boxes. The third chain runs over an upper drum, mounted on the same shaft as the other two drums, and a further drum which is used for operating by means of the endless chain shown. By moving this chain in one direction or the other, the three drums are made to rotate simultaneously in one direction; the lower frame and skip ascend, and when the turning is in the opposite way they both descend by their own weight.

The lower frame holds up the scoop G, enabling it to be worked. It is supported in front by the roller H, mounted on the axle, which acts as a brace between the two vertical posts, and also, in the rear, by the rod I, which forms a prolongation. The end of this rod is hinged to the shaft by a bevel pinion, the shaft passing through the boss of a bracing-plate uniting the two cheeks of a charging-truck. The latter runs on rollers over the rails on the lower frame, pushing the scoop gradually forward under the skip, and then into the retort. The sides of this truck support a shaft J, on which are mounted loosely a pinion gearing into the bevel pinion of the shaft prolonging the skip-rod, and other gearing engaging with a rack fixed under one of the longitudinal bars of the frame. The hubs of the pinion and the gearing are provided with clutches, with which those of a coupling keyed on the shaft can be made to engage as required. When the coupling is engaged with the gearing, and the shaft is made to rotate, the truck is displaced on the frame E; and when it is geared with the bevel pinion, the rod of the scoop must be turned—a movement which should be executed when the filled scoop has been introduced into the retort. The shaft J is set in motion by means of a hand-wheel, as shown, or in any other way.

The skip is furnished at the lower part (see figs. 4 and 6) with two doors K, united by outside straps or supports L, which can turn loosely on the pivots M. Each support is joined to a lever arm N or N^1, to open and close the doors. Lever N is on one side of the skip, and lever N^1 on the other, as these levers must be operated with different catches on the sides of the scoop. One of these catches, O, is on the front end of the scoop on one side, and the other O^1, at the rear end on the other side. Opposite each lever is an arm with a counterweight which holds the doors shut or open. When the scoop is in the position shown in fig. 5, the skip is shut. The scoop then advances, the catch O impinges upon the lever N, and the two doors open together as the result of the two pinions engaging. Fig. 6 shows the doors in this position. While the scoop thus advances under the skip, the coal falls into it. When it has advanced its entire length, the catch O^1 comes into contact with the lever N^1, and the doors close automatically. The filled scoop continues to enter the empty retort, and when it reaches the end, it is given a half turn, and the coal is discharged. The empty scoop is then drawn back to its first place, and turned 180° in order to bring it into the position indicated.

Fig. 7 shows a different kind of skip, having only one door, curved at the bottom. It is connected by arms P with an axle Q carrying a pinion R gearing with another pinion S, the axis of which supports a single arm furnished with a counterweight. As in the other type, the scoop has a catch O on the side in front, and another on the other side at the rear. The door has a stud opposite the front catch, and a lever T, mounted on the axis, is opposite the rear catch. When the scoop advances, its front catch comes into contact with the stud on the door, and opens it. Rotation of the pinion R turns the pinion S in the opposite direction, and the lever and counterweight move into the position marked by dotted lines. When the scoop has advanced as far as possible under the skip, being gradually filled during its progress, the rear catch impinges on the lever T, and moves it forward, turning the pinion S, which makes the pinion R, on the axis of the door, turn in the inverse direction, and the skip then closes automatically.

RAPID ESTIMATION OF CARBON DIOXIDE.

In the "JOURNAL" for the 12th ult. (p. 760), reference was made to a paper on this subject, read by Mr. LEONARD A. LEVY, B.Sc., F.I.C., at the December meeting of the London Section of the Society of Chemical Industry. The text of the paper is contained in the current number of the "Journal" of the Society, and from it the following extracts are made.

At the outset the author remarked that in numerous instances in which the examination of a mixture of gases containing carbon monoxide is required, a knowledge of the percentage of this gas is sufficient to check the course of the reaction which gives rise to the gases under examination. The absorption methods usually employed demand time and skill; and the absorbent employed—cuprous chloride solution—neither gives a sharp reaction nor indicates very small percentages. Methods for combustion also require considerable skill, and are somewhat lengthy. A calorimetric method capable of 0·3 per cent. accuracy would be sufficient for the majority of technical purposes; but of methods of this kind which have been published, none are sufficiently simple and accurate for industrial purposes.

Winkler has suggested that the depth of colour of the black cloud of reduced palladium formed when gas containing carbon monoxide is shaken up with a solution of cuprous chloride and palladium chloride, may afford an approximate means of estimating the quantity present. Potain and Drouin employ the progressive loss of colour experienced by palladium chloride solution on reduction by carbon monoxide in an attempt to estimate this gas. Various attempts have also been made to utilize the change of colour exhibited by dilute blood solution and the reduction of ammoniacal silver oxide for this purpose. But all these methods are vitiated by the presence of other reducing gases, and exhibit other defects. It was therefore decided to make experiments with other reagents. [These experiments the author proceeded to describe.]

Passing on to deal with the form of the "decolorization vessel," which, he pointed out, was very important, the author said the carbon dioxide must be completely absorbed, and at the same time the solution must be thoroughly well mixed up by the passage of the gas; otherwise the titration of the gas would be inaccurate. If a vertical cylinder be employed, the absorption is only about two-thirds complete, no matter what form the inlet orifice may take. An ordinary Winkler absorption coil is unsatisfactory, as the mixing is very incomplete, and a progressive decolorization proceeds up the tube, with the result that the bottom portion of the liquid is neutralized and saturated with carbon dioxide before the top portion has been brought into use.

A considerable number of trials were necessary before a satisfactory shape was arrived at. The form finally adopted is similar to a Winkler coil, except that the slopes of the individual coils are considerably steeper. In this form of decolorization vessel the solution is well mixed up by the passage of the gas, and numerous experiments have proved that the absorption is complete. The inlet tube is fitted with a rubber cork, in order to facilitate rapid washing after use. The strength of the baryta solution in the coil is such that it is exactly neutralized by the passage of 20 c.c. of carbon dioxide measured at normal temperature and pressure. The gas to be analyzed is therefore drawn successively through the absorbents for the removal of unsaturated hydrocarbons and carbon dioxide, the drying-tube, the oxidation-tube, and the decolorization vessel. A three-way tap is interposed between the two latter, so that the gas may be bye-passed till the commencement of a test. The internal air spaces are kept as small as possible, so that the passage of 100 c.c. of gas is sufficient to displace completely the residual gas in the apparatus.*

The following table gives some results obtained with mixed coal gas and water gas. The analyses were carefully performed with an accurate Hempel apparatus, and two cuprous chloride pipettes were employed for the absorption of carbon monoxide. Three observations on the same gas are recorded in each case.

Percentage CO by Analysis.	Percentage by Colour Test.	Difference.	Percentage CO by Analysis.	Percentage by Colour Test.	Difference.
14·1 ..	13·9 ..	−0·2	13·1 ..	12·9 ..	−0·2
14·1 ..	13·6 ..	−0·5	12·2 ..	12·4 ..	+0·2
14·1 ..	13·6 ..	−0·5	12·2 ..	12·4 ..	+0·2
13·2 ..	13·1 ..	−0·1	12·2 ..	12 ..	−0·2
13·2 ..	13·1 ..	−0·1	17·4 ..	17·1 ..	−0·3
13·2 ..	13 ..	−0·2	17·4 ..	17·1 ..	−0·3
13·1 ..	13·4 ..	+0·3	17·4 ..	17 ..	−0·4
13·1 ..	13·4 ..	+0·3			

The results invariably agree to within about 0·3 per cent. with analyses made with the most accurate forms of apparatus.

When the gas contains but little carbon monoxide, the baryta solution is diluted so that it is neutralized by the passage of 2 c.c. of carbon dioxide. Definite volumes of coal gas (of known carbon monoxide content) and air were mixed together, and the percentage of carbon monoxide was calculated, as shown in the figures next page.

* The apparatus, which is manufactured by Messrs. Alexander Wright and Co., Limited, was described and illustrated in the "JOURNAL" for the 19th ult. (p. 818), and was on view at the Physical Society's annual exhibition.

Percentage CO Calculated.		Percentage by Bunte.		Percentage by Test.
1·7	..	1·6	.	1·3
0·8	..	0·7	..	0·4
1·2	..	1·3	..	1·0

The above results indicate that the absorption of carbon dioxide by the more dilute baryta solution is not quite complete. This can be corrected by suitably decreasing the strength of the baryta.

The following method can be employed to give accurate results for gases containing only traces of carbon monoxide. The gas is drawn by means of a filter pump through a meter and then through the apparatus; a strong solution of baryta being employed. After a certain period, depending upon the amount of gas oxidized, the pump is stopped, and the excess of baryta is back-titrated with oxalic acid. This method should be of value in the analysis of fumes from gas-stoves, mine air, air from lime-kilns, &c.

The total decolorization, when the concentrated baryta solution is employed, takes place during the passage of about 10 c.c. of gas containing 20 per cent. of carbon monoxide, or during the passage of 2 c.c. of carbon dioxide. The "decolorization vessel" coil is mounted in an observation box, and is viewed against a piece of white opal glass. It is very easily noticed, and different observers obtain identical readings. The speed of aspiration is about 200 c.c. in six minutes; and this volume corresponds to a gas containing 10 per cent. of carbon monoxide. If the percentage is higher, the time required for an estimation will be still less. The standard baryta solution is stored in a Winchester quart, fitted with a special burette arranged so as to deliver the solution without any contact with atmosphere.

In the course of the discussion upon the paper,

The Chairman (Mr. E. Grant Hooper) remarked that there would be general agreement that the apparatus before them was very neat and probably exceedingly useful. When Mr. Levy spoke of a comparison "by analysis," did he mean a determination by combustion or by titration of the iodine set free? The process and the apparatus brought before them were designed, he gathered, not so much for laboratory work as for technical use by non-chemists.

Mr. J. H. Coste said there was one defect in Mr. Levy's method —viz., that its accuracy was less as the quantity of carbon monoxide in a mixture became greater. This he thought was a distinct inconvenience, as he absorbed a fixed quantity of carbon monoxide; and when there was a great deal of carbon monoxide in the gas, a smaller quantity of gas was passed, and consequently the measurement was less sensitive. When the quantity of carbon monoxide was small, he could conceive there might be some difficulty owing to the alkalinity of the glass. Had Mr. Levy found any difficulty with this?

Mr. Arnold Philip said he had carried out many experiments with the Levy and Pécoul apparatus, in which the amount of free iodine liberated was determined, and very minute quantities of carbon monoxide could be measured with moderate accuracy. The lowest amount which he understood the author could measure was about 0·4 part per cent.; and the accuracy for this amount was only of the order of 30 per cent. Air containing 0·4 per cent. of carbon monoxide was, of course, highly poisonous. Was it not possible to obtain a much more sensitive determination?

Dr. G. Martin strongly doubted the advisability of making men who were not trained chemists carry out chemical tests. His own experience was that the results were never satisfactory, and that there was a liability to enormous errors owing to defective manipulation. In the present case, such errors might very possibly be attended with serious results. In the apparatus under consideration, he thought the preparation, preservation, and use of the necessary solutions would require the attention of a properly qualified chemist; and in such hands, no doubt, the instrument would give valuable results. The fundamental idea was certainly an ingenious one, and the apparatus was neat.

Mr. G. N. Huntly said it was remarkable how this method of determining carbon monoxide had escaped getting into the text-books, though it was described more than twenty years ago. He distrusted the minimetric method used by Mr. Levy, as similar methods proposed for the determination of carbon dioxide in air were unreliable. But it was quite possible that the special form of absorption-tube proposed by the author would overcome these difficulties.

Mr. Levy, in reply to the Chairman, said the analyses to which he referred were those of the carbon monoxide in a given sample of stored gas, compared with the result obtained on his apparatus. His apparatus was meant to replace the Orsat, where the determination of the carbon monoxide was the chief essential. The results given by his apparatus were far more reliable than those of the Orsat; but it was not intended to give the value of the carbon monoxide to the accuracy of 0·1 or 0·2. With ordinary care, the estimation would be accurate within 0·4 per cent. He had heard from many people, and it had also been his experience, that the results when the Orsat apparatus was employed were never very satisfactory; and they became progressively worse. The alkalinity of the glass, no doubt, affected the determination if the apparatus were employed for very delicate determinations; but this was not quite what it was meant to cover. The colorimetric estimation of the iodine liberated absorbed in chloroform had the objection which was attached to all colorimetric estimations—viz., the difficulty of accurate matching. The same objection applied to Dr. Haldane's method with blood. In that case the colour changed from yellow to pink; and it was rather difficult to see when the pink colour exactly matched the standard colour. In the method described, it had not been intended to give any idea of the percentage of carbon monoxide in a gas which contained less than 0·1 per cent.; and though it was quite reliable up to this limit, he recommended the method of back-titration for very small quantities. People who were not chemists—such as engineers who had control of steam plants and producer plants—had to make these tests. They frequently desired to know the percentage of carbon monoxide and dioxide in the gas they had to examine, and they were generally accustomed to employ the Orsat apparatus for the purpose. He believed this apparatus was absolutely useless for carbon monoxide; and the test which he had submitted to the meeting was really meant to replace the Orsat so far as carbon monoxide was concerned, when this was the constituent in which the observer was chiefly interested.

NEW PORTABLE PHOTOMETERS.

The technical section of the current number of the "Illuminating Engineer" contains notices of two portable photometers to which attention may be directed. Messrs. Clayton H. Sharp and Preston S. Millar describe a new small model of their universal portable photometer. The authors point out that it is an important principle, to be recognized in connection with portable instruments, that although observational errors up to (say) 3 or 4 per cent. may be permissible, there should be no inherent errors due to the construction of the instrument. Hence, in designing this small model, care has been taken to incorporate the essential features of the former one, so that there is only a loss of accuracy so far as the reading is concerned. A diagram is given showing the arrangement and principle of the photometer; and the procedure followed in calibrating it and carrying out the measurements of candle power or illumination is described. In an article by Messrs. J. S. Dow and V. H. Mackinney, they describe the new model of the "Holophane" lumeter, which contains improvements upon the original instrument described in the "Journal" on its introduction rather more than a year ago, for which credit is given in a large measure to the makers, Messrs. R. & J. Beck, Limited. The apparatus as now constructed is much more compact than before, has a single scale, and is provided with dark glasses which greatly increase the range, so that it is possible to read up to 2000 foot-candles, and thus to measure the brightness of illuminated lamp-shades, &c., with a view to testing the "glare." A diagram of the instrument is given, and its advantages are summarized. One of these is its portability, which allows of its ready removal from room to room; and another, that only one person is needed for the photometric manipulations, and he can make all the observations in one position.

Official Changes in the Birmingham Gas Department.

The report of the Gas Committee of the Birmingham Corporation to be submitted to the Council to-day sets out the official changes in the Gas Department consequent upon the appointment of Mr. F. J. Bywater as Engineer of the East Greenwich station of the South Metropolitan Gas Company. Indication has already been given in the "Journal" as to the nature of these changes. Mr. Walter Chaney, now at Nechells, will take Mr. Bywater's position at Saltley; and Dr. W. B. Davidson, the Chief Chemist, is to succeed Mr. Chaney, who will continue to have supervision over the Adderley Street works, and if the Committee's recommendation should be adopted, have his salary increased by £100 per annum. Similar increases are proposed in the cases of Mr. John Foster and Mr. T. H. Hack, the Engineers at Windsor Street and Swan Village. To fill the position of Chief Chemist, the Committee recommend Mr. E. W. Smith, who has charge of the high-pressure laboratories in Newhall Street. He will retain the supervision of these and the workshops, in addition to controlling the coal-testing plant at the central laboratory, of which Mr. G. C. Pearson, who has for some time been in actual charge of the plant, under Dr. Davidson, will be Superintendent, under Mr. Smith.

A chimney for diffusing the products of combustion into the atmosphere, the upper portion of the shaft being pierced by a large number of holes, was recently illustrated in the columns of a German publication. It is designed to overcome the damaging effect on vegetation of the sulphurous products of combustion. It is felt that chimneys of lofty height do not altogether meet the problem, particularly if the upper strata of the atmosphere are quiescent. A chimney about 100 feet in height was built with the topmost part of the shaft, for a length of about 21 feet, pierced with conical holes with the larger openings in the outside face of the chimney. The wind enters freely into the chimney through these holes, diluting the smoke and developing a vortical action. Through the side opposite to the wind, the quantity of gas which will escape through the holes is generally of little importance, because of the shape of the holes. It is held that the vortical action, together with the diffusion within the top of the chimney, reduces the diameter of the zone of vegetation endangered by the sulphurous gases.

REGISTER OF PATENTS.

Manufacture of Water Gas.

GLASGOW, A. G., of Richmond, Virginia, U.S.A., and Victoria Street, Westminster.

No. 28,855; Dec. 12, 1910.

This invention relates to water gas manufacture by the intermittent process, where the "run," or period of gas making (when heat is absorbed from the fuel-bed), and the "blow," or period of air blasting (when the heat is restored to the fuel-beds), alternate.

In this process there is now usually employed (the patentee points out) a generator through which the air-blast passes always upwards, whereas the direction of the gas-making steam is reversible, so that it passes either upward or downward at the option of the operator. But, where economy in fuel is of prime importance, and it is desired to minimize the percentage of carbon monoxide in the generator blast products, the twin-generator system has been adopted. This system alters the distribution of the fuel-bed during gas making from that provided during air blasting, by connecting two generators at the bottom so that the air-blast always passes upward through them in parallel, whereas the gas-making steam passes down through one and up through the other, in alternating series. Therefore, more complete conversion of the oxygen of the steam to carbon monoxide is ensured by the passage of the steam through two heated fuel-beds, whereas the divided air-blast passes through only one fuel-bed—thus minimizing the percentage of carbon dioxide in the water gas and the percentage of carbon monoxide in the blast products.

The objection to this twin-generator system, the inventor proceeds, is that the output of gas is but little more than half of that obtained from a single generator of the same grate area. To overcome this deficiency, he increases the depth of each of the twin generators to that of a single generator and (in addition to, or in substitution for, series steaming) admits steam in carefully regulated and varying proportions to the bottoms of the twin generators. But even when so much bottom steam is substituted for series steam (either in modified series running or for parallel up-running) that it seriously disturbs the proper distribution of heat—causing the clinker to adhere to the generator wall and notably reducing the efficiency of the system—the output from a modern single generator still remains nearly one-third greater than that obtainable with the twin-generator system. This has hitherto been considered an inherent disadvantage, inseparable from the twin-generator system, which must be compensated for by superior fuel economy; and special efforts have been made to minimize this disadvantage in carburetted water gas construction by the use of common fixing chambers, blast valves, &c., and otherwise simplifying and perfecting twin-generator plant.

If the gas-making steam be passed downwards in the two generators simultaneously, instead of through both generators serially, a great increase in output of gas is said to result; and the patentee has invented plant comprising two generators connected as by a common bottom, separate valve controlled gas outlets from the tops of the generators, steam inlets to the tops and bottoms of the generators, optional gas outlets from the bottoms of the generators, and means for optionally connecting and operating the gas outlet valves so that the two top gas outlets open and close together, and the bottom gas outlets open when the top gas outlets close and close when the top gas outlets open and the gas-making steam passes in proper proportions through the generators simultaneously either all downwards or all upwards, or disconnecting the gas outlet valves so that the gas-making steam passes through the generators serially in either direction supplemented by steam for the second generator at the option of the operator.

The bottom gas outlets remain closed when steam is admitted to the top of one generator or to the top of the other generator or to the bottoms of both generators, but open when the top gas outlets are both closed and steam is admitted simultaneously to the tops of both generators—thus (when the other inlets and outlets are correspondingly opened and closed) converting the plant into what is, in effect, either two generators working together as a pair of generators according to the single generator system, or else a single setting of twin-generator plant.

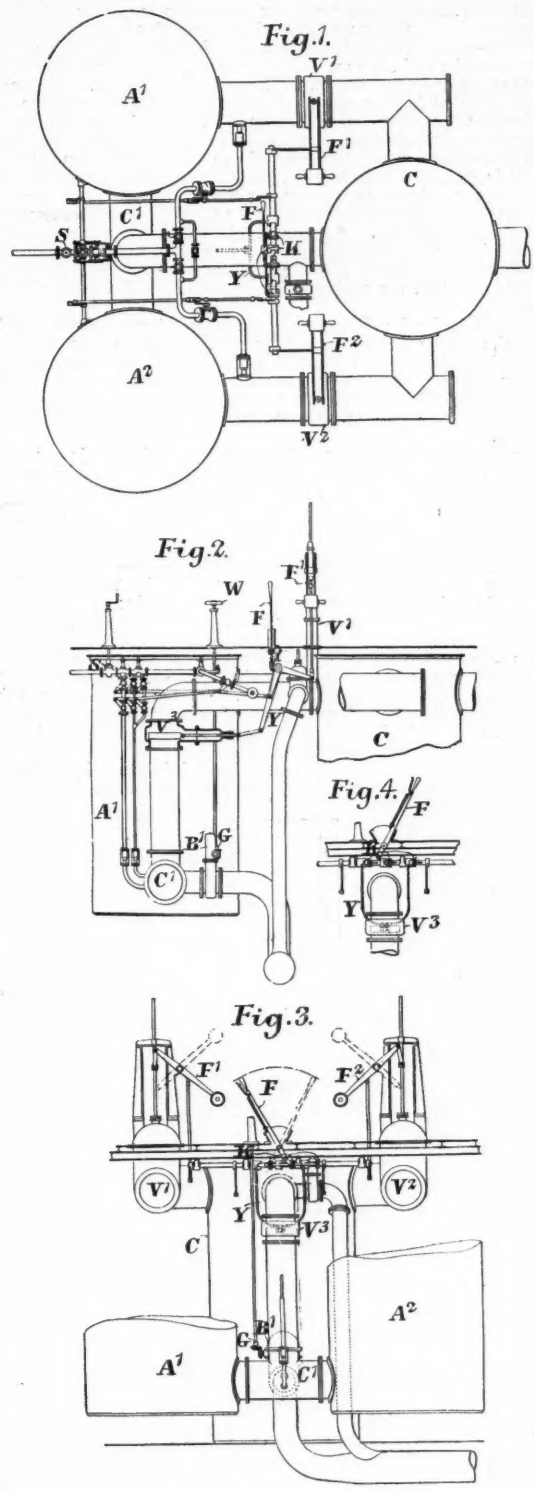
In this way, the apparatus can be worked according to either of two processes with a single plant. One method possesses all of the advantages as to capacity of the single generator system, where the gas-making steam passes either all upwards or all downwards, with the further advantages, in the larger sizes, that the former single generator is divided into a pair of smaller generators, thus facilitating clinkering and the more perfect distribution of air and steam throughout the cross sections of the smaller fuel-beds. The other method has all the economical and structural advantages of the twin-generator system, where the gas-making steam passes for a time all upwards through the two generators in parallel and then for a time down through one and up through the other generator in alternating series, supplemented by steam for the second generator at the option of the operator, or *vice versâ*.

The chief difficulty in supplying gas is to adjust the production to the demand without waste and extra reserve and storage plant; but with the present invention an increase in output of nearly one-third is immediately available at will without the labour, waste of fuel, wear and tear, and delay incidental to starting up a spare section. Thus, three sections of plant, while working normally at maximum twin-generator efficiency, can be immediately changed to the single generator system of working, so as to produce for any length of time the approximate output of four such sections working on the twin-generator system, without increase in the cost of generating labour and repairs, and without having to keep plant and specially trained men in reserve for occasional use.

The apparatus can be variously arranged; but it is preferable that it should be provided with valve connecting and operating mechanism such that it can be set, as by the movement of a clutch, to ensure the proper operation in gas making of the controlling devices when running on the one system or the other until re-set. Furthermore, it is preferable that, in changing over from the one system to the other, the proportional distribution of steam to the generators should be automatically varied to suit the different conditions.

Fig. 1 is a plan. Fig. 2 is a side elevation, partly in section, with the near generator removed. Fig. 3 is a front elevation, partly in section, with some portions removed.

The bottoms of the generators A^1 and A^2 are connected by the conduit C, which has an optional gas outlet passage controlled by a valve. The tops of the generators are provided with blast and gas outlet



Glasgow's Water-Gas Plant.

passages controlled by valves V^1 V^2 operated by the levers F^1 F^2, which are also operatively connected by arms and links, or the like, with shafts in line with each other and adapted to be coupled together and to the yoke Y. F is a change-lever operatively connected to a link of the clutch K, whose members are splined on the shafts just referred to, and coupled by swivels to a connecting link, so that these members travel along the shafts in response to the movement of the lever F. The members couple these shafts simultaneously with the yoke Y and with each other, so that the three valves V^1, V^2, V^3 must all work together in unison—V^3 being closed when V^1 and V^2 are open, and

open when V^1 and V^2 are both closed. But when the clutch is not so engaged, each shaft is free to rotate separately without disturbing the yoke Y or each other.

B^1 is the valve, operated by the gearing G and wheel W, which controls the admission of air-blast to the bottoms of the two generators for blasting upwards in parallel; and the blast-products issuing from the generators may be discharged into the atmosphere, or utilized for the production of steam, or passed into an oil-gasifying chamber C through the passages shown, or disposed of in other ways.

S is the steam-cock controlling the admission of gas-making steam to the distributing and regulating system, which system automatically causes the steam to pass through the generators in proper proportion all upwards in parallel, or serially—down through one and up through the other—in either direction, supplemented by whatever bottom steam (if any) may be desired, or all downwards in parallel, according to the setting of the gas outlet valves. When steaming serially, the quantity of steam needed for the top of the first generator is more than that required for one generator but less than is required for both generators in parallel down-steaming. The proper intermediate regulation is provided by means of a regulating cock in the loop connection, which is neutral in parallel down-steaming, but in series steaming automatically adds to the top of either generator any desired proportion of the total quantity of steam that is available for the top of the other generator in parallel down-steaming. Supplemental bottom steam in series working is supplied, if and as desired, through a stop and regulating cock. The several steam supplies are thus provided with separate independent regulation, so that the setting of any may be varied without altering the others.

As shown in the drawings, the change-lever F is set to disengage the clutch K, and the plant is ready for working on the twin-generator system—in other words, for steaming upwards in parallel, or serially in either direction with optional bottom steam, according to whether both the valves V^1 V^2 are opened or only one of them. The valve V^3 is closed during steaming upwards in parallel or serially in either direction.

To change from the alternating series method of twin-generator operation into a pair of generators which steam together in parallel either upwards or downwards, the operator has only to move the change-lever F to its other position, as shown dotted in fig. 3. This movement causes the clutch K to couple the shafts with the yoke Y and with each other, so that the two gas-valves V^1 V^2 and the optional gas outlet valve V^3 must all work together in unison—V^3 being closed when V^1 and V^2 are both open, and open when V^1 and V^2 are both closed. Steaming upwards in parallel now proceeds; but upon moving either lever F^1 or F^2 to its other position, as shown dotted in fig. 3, both gas-valves V^1 and V^2 are closed and the gas-valve V^3 opened. This movement also causes the steam-cocks to automatically direct properly regulated quantities of steam simultaneously to both generator tops for steaming downwards in parallel. The finished gases leave the generator bottoms by way of the conduit C^1, through the gas outlet valve V^3; or, if desired, a separate bottom gas outlet passage and valve may be provided for each generator.

The reversal of the steaming from downwards in parallel to upwards in parallel independently regulated is automatically effected by simply returning one of the levers F^1 or F^2 to its former position, thereby causing both gas-valves V^1 and V^2 to open and the gas-valve V^3 to close. To resume serial steaming, the change-lever F is returned to its former position, thereby uncoupling the shafts from the yoke Y and from each other.

Steam Generation, Feed-Water Heating, and the Heating of Liquids in General.

Bone, W. A., of Leeds University, Wilson, J. W., of Armley, near Leeds, and M'Court, C. D., of Balham Hill, S.W.

No. 2404; Jan 31, 1911.

This invention relates to the heating of liquids by the heat resulting from gaseous combustion, and has reference to the class of apparatus in which the heated products of combustion pass through tubes which traverse the vessel containing the liquid or vapour to be heated before being discharged into the atmosphere.

The principal objects aimed at are to utilize for the purpose in view as large a proportion as possible of the available heat produced, and at the same time to transmit a great proportion of heat per unit area of heating surface in an apparatus which may be of comparatively small dimensions and of simple design.

In a previous patent—No. 4362 of 1910—the patentees described apparatus for steam generation and like purposes, comprising a boiler traversed by tubes packed with refractory granular material in which a steady and continuous flow of a homogeneous mixture of combustible gas and air (there being sufficient air in the mixture to allow of complete combustion of the gas) is caused to ignite and completely burn in contact with the granular material; the homogeneous mixture of gas and air being supplied to the boiler-tubes under pressure from a suitable feeding chamber. In their present invention, they describe other means of causing the homogeneous combustible mixture to enter, and its products of combustion to traverse, the boiler-tubes—involving the substitution of the suction of a fan or the like applied to the exit ends of the boiler-tubes for the positive pressure of the combustible mixture in the feeding chamber as described in the 1910 patent.

In order that the nature of this invention and the manner in which it is to be performed may be understood, the patentees describe it in detail with reference to the utilization of coal gas (or coke-oven gas which has been cooled and cleaned from dust or tarry matter) for steam generation. Fig. 1 represents an elevation, partly in section, of the apparatus. Fig. 2 is an enlarged detail. B is a cylindrical boiler shell 3 ft. to 4 ft. long, traversed by a number of boiler-tubes T (3-inch bore or thereabouts) closed at their entrance ends with fire-clay plugs P, each of which is provided with a central aperture for the admission of the combustible mixture of gas and air. The tubes are packed with granular or fragmentary refractory material G, made by crushing fire-brick to pass a 1-inch mesh; the finer material, such as will pass a ½-inch mesh, being rejected. The granular material is kept in position at the exit ends of the tubes by grids. S is a chamber corresponding to the "smoke box" of an ordinary multitubular boiler (although in this case the combustion is smokeless). The chamber is connected by the duct H with the feed-water heater A, which is itself similarly connected by a duct with the fan F, which maintains the suction necessary to draw the gases through the system and also discharges the cooled products of combustion to a chimney J. The damper D regulates the gaseous flow through the system. The chamber H is provided with doors which, when open for the purpose of charging the tubes T with granular material, occupy the position shown by the dotted line. The chamber should be so constructed that when the doors are shut there shall be no leakage of air through any of the joints when under a suction of 20 inches water-gauge (this also applies to other joints in the system). The granular material is placed in the tube and pushed home, as described in the earlier patent. The

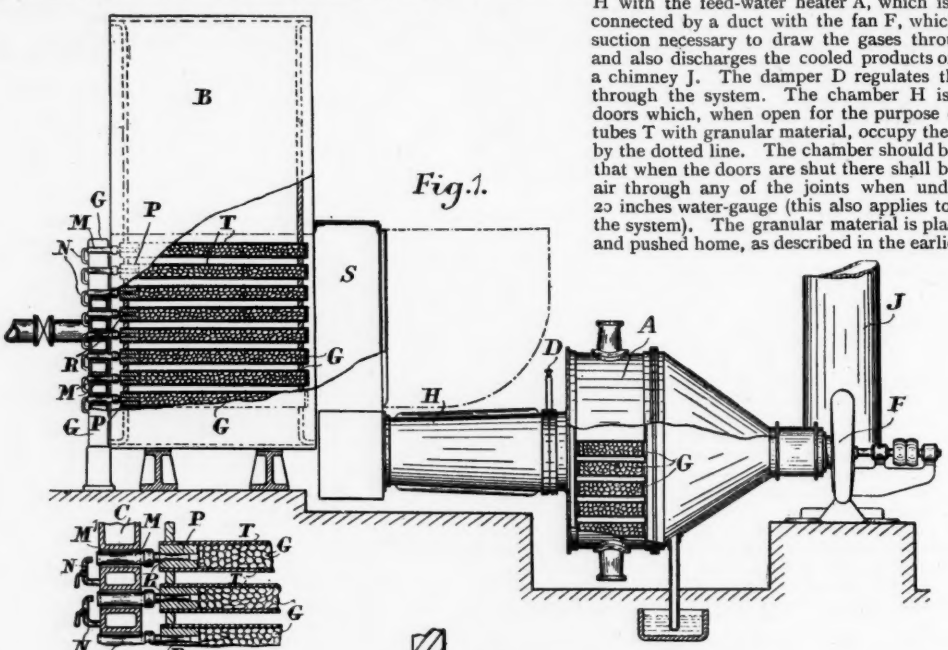


Fig. 1.

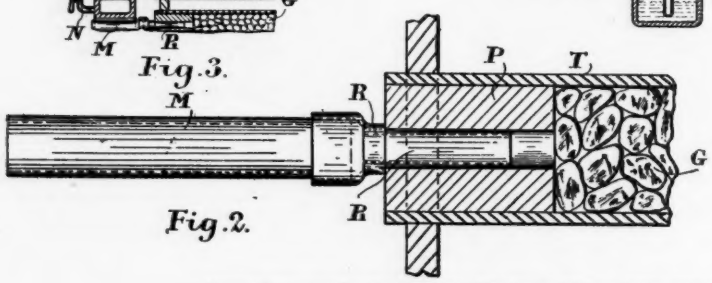


Fig. 2.

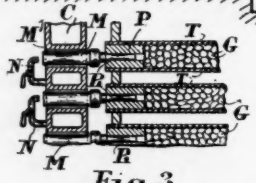


Fig. 3.

Steam Generator for Gas Heating—The Bone-Wilson-M'Court Patents.

feed-water heater comprises a shell A traversed by tubes packed with granular material similar to the tubes T of the boiler shell B.

C is a chamber (attached to the front of the boiler) to which the combustible gas is admitted under suitable pressure—for example, 2 inches water-gauge in the case of coal gas—from the main, under regulation; and there are openings in the chamber through which pass pipes M leading into the fire-clay plugs P. Centrally opposite each pipe M is a jet N controlled by the valve. This means of supplying combustible gas to the boiler-tubes admits of a direct view being obtained from the front of the boiler through the central aperture in each fire-clay plug. Hence it may be readily determined, by observation, whether the required condition of incandescence is maintained in the granular material situated in the entrance end of each boiler-tube. For the sake of clearness, this arrangement is shown in fig. 3.

When it is required to fire less than the total number of boiler-tubes present, iron caps are screwed over the open ends of the mixing-tubes connected with the boiler-tubes which it is desired not to fire, with the object of preventing cold air from being drawn through them.

The admission to each boiler-tube, under given working conditions, of the desired amount of combustible gas, together with its proper proportion of atmospheric air, as well as the complete admixture of the gas and air before reaching the zone of combustion, is effected under the suction of the fan with the aid of the device shown in fig. 2. M is a tube of such length and cross section as to cause the combustible gas and air drawn through it under the action of the fan to mix completely prior to entering the granular bed. R is a tube connected with the larger tube M, and of such cross section as to cause a homogeneous and explosive mixture of combustible gas and air to be drawn through at a speed considerably in excess of the speed of back-ignition of the mixture—to the intent that no combustion of the explosive mixture shall take place prior to entering the bed of granular material situated in the boiler-tube.

With the arrangements described, and when employing coal gas, the inventors have found that the tube R may be conveniently of $\frac{5}{8}$-inch bore and about $3\frac{1}{2}$ inches long, and the tube M 1-inch bore and about 8 inches long, and that a suction at the fan amounting to 15 inches water-gauge is suitable.

In securing the pipe R in the fire-clay plug P a refractory cement may be employed consisting of a mixture of sodium silicate and ground calcined fire-clay. The fire-clay plug P may be secured in the boiler-tube T by winding with asbestos string or the like prior to insertion.

An important function of the plug P is to protect the joint of the boiler-tube in the tube-plate from the action of the heat. Owing to the fact that the whole of the heat is generated inside the boiler-tubes in a zone well removed from the tube-plates, it is possible to generate steam at so great a rate as corresponds to an evaporation of 20 lbs. of water per square foot of heating surface per hour without any liability of overheating the tube-plates or the joints of the tubes therein.

In general, the method of starting up the boiler will be first of all to set the fan going and then to turn on and ignite the combustible gas at each jet N. The resulting flames extend into the mixing-tubes M and proceed to heat the granular material at the entrance ends of the boiler-tubes. As soon as the granular material near the fire-clay plugs P becomes sufficiently incandescent, each gas jet N is momentarily turned off and immediately turned on again, with the object of extinguishing the flame and of causing a mixture of gas with air sufficient for its complete combustion to be drawn through the mixing-tube M and the aperture of the plug P on to the incandescent granular material in the tube T, where the combustion now takes place.

The most suitable length of tubes T to employ will depend on their diameter, on the calorific intensity of the gas employed, on the rate of consumption of the gas, and on the temperature at which it is desired that the products of combustion should leave the generator. And, in general, it will be found (the patentees point out) that the invention lends itself to the construction of boilers provided with tubes shorter than those usually employed. For example, they have found that when burning coal gas or coke-oven gas at the rate of 100 cubic feet per hour per tube, the tube or tubes need not be more than 3 to 4 feet long and 3 inches internal diameter.

In order to give some idea of the combined high thermal efficiency and high rate of heat transmission obtainable by their invention, they quote the following results of a test upon a horizontal boiler with tubes 3 feet long (each tube being fitted with a fire-clay plug and packed with crushed fire-brick in the manner described) and fired with a mixture of coal gas (of net calorific value 560 B.Th.U. per cubic foot at N.T.P.) and air in such proportions that the products of combustion contained only 1 per cent. or 2 per cent. of oxygen, but no trace of unburnt gas. When supplying to each tube of the boiler 100 cubic feet of coal gas per hour *plus* air sufficient for its complete combustion and generating steam at 120 lbs. per square inch above atmospheric pressure, the products of combustion left the ends of the boiler-tubes at a temperature not exceeding 240° C. (464° Fahr.), or only 69° C. (123° Fahr.) above the temperature of the water in the boiler; and although the products contained no more than 2 per cent. of oxygen, the combustion of the gas was perfect. After the products had traversed the "feed-water heater," their temperature was reduced to about 95° C. (203° Fahr.). The thermal efficiency of the boiler *plus* feed-water heater exceeded 92 per cent., reckoned on the net calorific value of the gas; and the rate of evaporation in the boiler exceeded 21 lbs. per square foot of heating surface per hour.

Grates for Gas Producers or Furnaces.

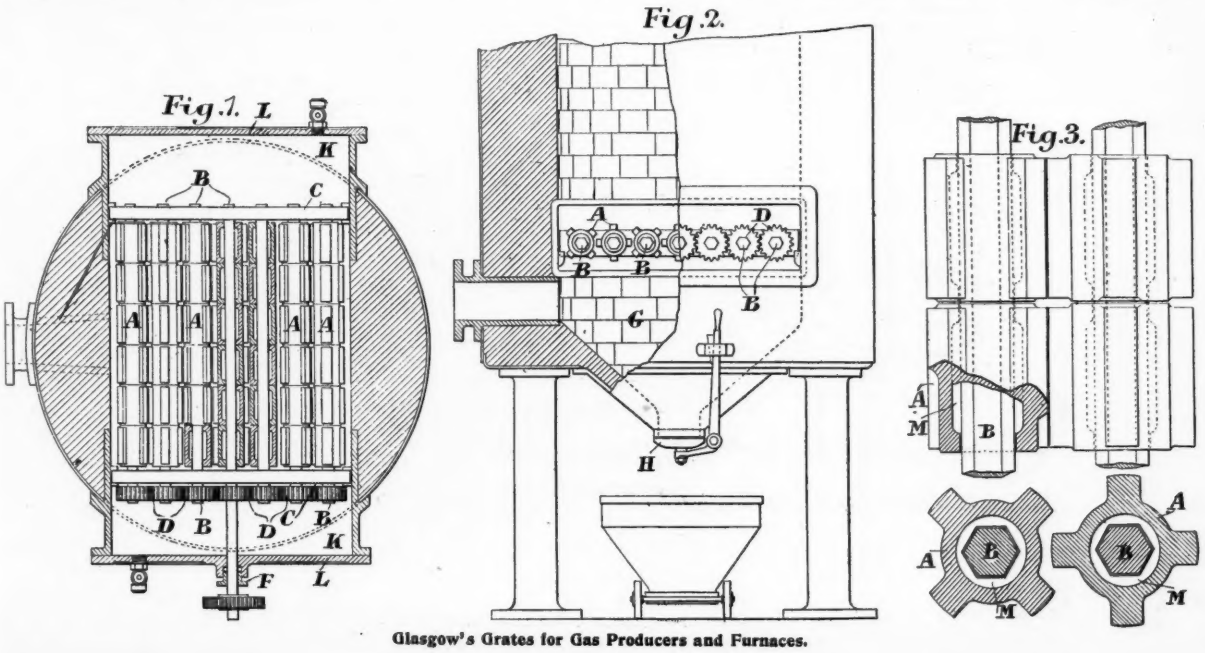
GLASGOW, A. G., of Richmond, Virginia, U.S.A., and 38, Victoria Street, Westminster.

No. 8537; April 5, 1911.

This invention, relating to water gas or other producers or furnaces, has for its object the continuous extraction by mechanical means of ash and clinker from the fuel bed as it is being formed—thus dispensing with hand labour and the periodic cessation of gas-making for the purpose of cleaning the fire. In addition to the saving of labour and time, the invention, in consequence of the continuous removal of the ash as it is being formed, "keeps the fuel-bed in an open and uniformly active condition, and thereby greatly increases its efficiency for both gas making or combustion as the case may be."

Figs. 1 and 2 show in plan and elevation (partly in section) the lower portion of a water-gas producer equipped with a grate according to this invention. The grate upon which the fuel bed is supported consists of composite cylinders or rollers made up of hollow sections A, which envelop central rotating bars or shafts B, mounted in bearings provided at each end by the bearing bars C. The bars B extend beyond one of the bearing bars C, and are fitted within the shell of the producer or furnace with toothed wheels D, which mesh with each other. One of the bars B is provided with an extension E, which passes through a gas-tight stuffing box F to the exterior of the producer, where it is fitted with a sprocket wheel or other means of gearing with the actuating motion—the movement of this one bar thus setting all of the bars B into proper action. The surfaces of the rollers are, if necessary, shaped with projections to take hold of the ash and clinker and carry it down through the spaces between the rollers, whence it falls into the ash-collecting hopper G beneath. This hopper is periodically emptied by a quick-opening discharging door H actuated by a lever. The spaces between the rollers provide access to the fire for the air-blast and steam, which also enter the fuel-bed through the spaces around the ends of the grate within the doorways K.

Fig. 3 shows in detail one construction of the enveloping sections and the manner in which the sections are mounted upon their actuating central bars B. The enveloping sections are made to slide loosely upon their bars so that they can be easily removed and replaced when worn out, or if a different fuel requires any alteration in their shape; and they bear upon their bars only at their ends, leaving insulating air paces M between the enveloping sections A and the bars B to protects the latter from the heat of the fire. The sections enclose the spaces M—that is to say, there are no apertures in the walls of the sections through which clinker or fuel can pass from the fuel-bed into the spaces



Glasgow's Grates for Gas Producers and Furnaces.

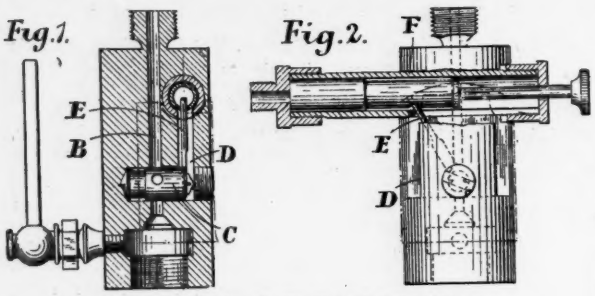
and through which air can pass from the spaces M into the fuel-bed. The speed at which these rollers are made to revolve is adjusted to suit the character of the fuel used at the time. The doorways K are provided with removable doors or lids L, thus giving ready access to the grate.

Pneumatically-Operated Gas-Valves.

EDWARDS, A. N., of Farringdon Street, E.C.

No. 10,308; April 28, 1911.

This pneumatically-operated gas-valve is particularly applicable for use with high-pressure gas, though not restricted to this application. The valve belongs to a type wherein a pneumatically-operated piston is mounted in a chamber that has no communication with the gas-ways; and the gas-controlling valve (which sometimes takes the form of a rotatable plug) is connected by a lever to the piston. In the particular form to which the invention is applied, a pneumatically-operated gas-valve of this type has the piston disposed transversely to the vertical axis of the fitting, and the plug that constitutes the gas-controlling valve carries an arm that is disposed approximately parallel to the axis and has operative engagement with the piston.



Edwards' Pneumatically-Operated Gas-Valves.

In the illustration of one method of carrying out the invention, the fitting has a socket for the reception of a gas-conduit, and is provided with a bye-pass as usual. Through the fitting extends a gas-way B, intersected by a cylindrical pocket containing a rotatable plug C, with a passage that extends right through it, and can be brought into, or out of, register with the gas-way. The pocket is intersected by a slot D extending through the fitting from side to side; but it does not communicate with the gas-way. In this slot lies an arm or lever E rigidly secured by the plug. Near one end of the fitting is a cylindrical chamber F that extends out at each end beyond the fitting, and whose longitudinal axis is transverse to that of the fitting. This chamber contains a pneumatically-operated piston, and is closed (as usual) with caps, one of which receives the pneumatic connection, while the other is perforated so that a rod carried by the piston may extend through it for hand operation.

The operation of the device is as follows: Pneumatic pressure applied to the left-hand side of the piston (fig. 2) causes it to travel to the right, carrying with it the arm E; and as this is rigidly fixed to the plug C, the latter will be turned about its longitudinal axis, so that the transverse passage through the plug will be brought from the "off" position, in which it is shown, to align with the gas-way B—thus permitting the gas to pass through to the burner. On the suction action of the pneumatic apparatus, the piston will be moved in the reverse direction and the plug C again turned to the "off" position.

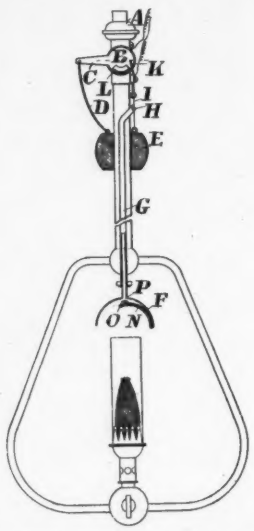
It will be seen, the patentee points out, that the arm E affords considerable leverage, and the tendency to hold the plug C against rotation by any fouling due to the gas is small compared with the effort of fouling upon a sliding member such as the piston. It follows therefore that the piston being always free through the gas not having access to the chamber wherein it is enclosed, the plug C can be operated against considerable resistance. "The valve is therefore one that is well adapted for use with high-pressure gas, as the friction tending to hold the plug when subject to pressure is easily overcome by the leverage of the arm E."

Safety Device for Gas-Lamps.

KAMP, W. A. J. VAN DE, of Haarlem, Holland.

No. 13,411; June 3, 1911.

This invention relates to a gas-lamp which is furnished with a safety device, consisting of a funnel for the reception of any gas which may accidentally escape from the burner and a pipe which causes the gas that may thus escape to flow towards an ignition pill attached to a thread carrying a weight which falls when the thread is burned away and by this means closes the gas-cock.



Van de Kamp's Safety Device for Gas-Lamps.

As shown, beneath the ball-and-socket joint A there is inserted into the gas-pipe a cock B, the arm C of which is controlled by a thread D with a weight E adjustably mounted on the gas-pipe. Above the lamp is a funnel F (for the reception of any escaping gas), provided with a pipe G arranged within the gas-pipe. At the outlet of the pipe G is an ignition pill H, which is attached to a thread I, which holds the weight. When gas flows through the pipe G, the pill H becomes incandescent, with the result that the thread burns away and allows the weight to fall and thus close the cock, which, in turning, attracts electrical contacts K L and causes an alarm signal to be sounded. Within the funnel F is a metal strip P, which (like a Breguet's thermometer) is composed of two different metals soldered together and of different coefficients of expansion. When the flame is ignited, the heat emanating from it causes the strip to expand, whereupon the plug O, with which it is furnished, closes the mouth of the funnel and "protects the ignition pill from the injurious effects of the action of the products of combustion, which are no longer able to reach it."

Regenerator for Retort-Furnaces.

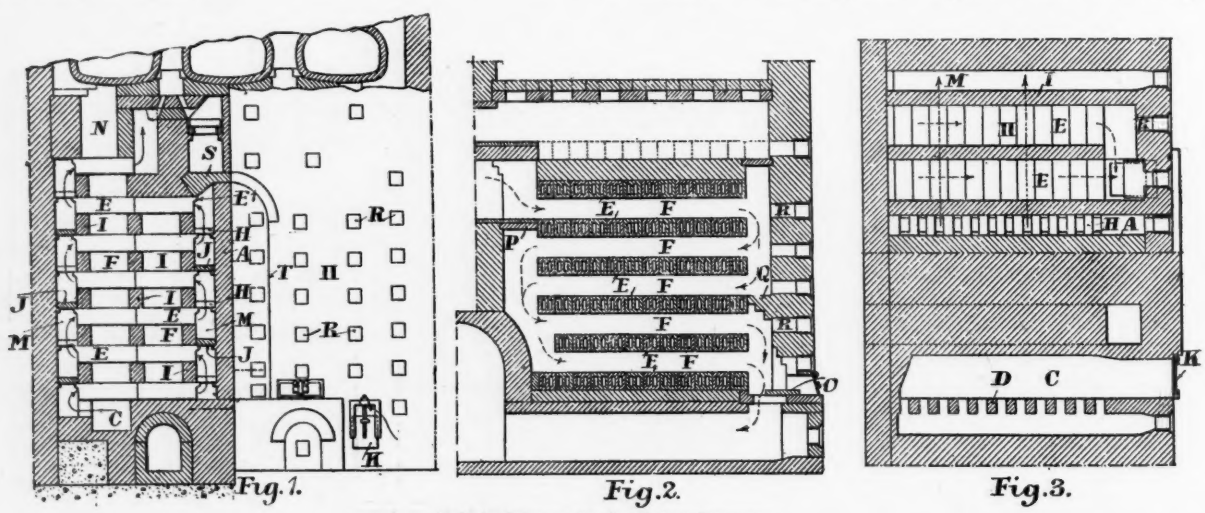
DEFOY, A. A., of Havre, France.

No. 12,228; May 20, 1911.

One construction of a regenerator in accordance with this invention is shown in the illustration applied to a setting of gas-retorts.

Fig. 1 shows the regenerator partly in front elevation and partly in section. Fig. 2 is a vertical section of fig. 1. Fig. 3 is a horizontal section.

The symmetrical parts I. and II. of the regenerator are separated from one another by a wall A, which extends the whole depth of the apparatus. In each part, circulation of air takes place through the conduits E of refractory material placed side by side, and disposed in horizontal tiers. The smoke flues F separate the tiers of refractory



Defoy's Regenerator for Retort-Furnaces.

conduits—being bounded top and bottom by the conduits themselves, and at their sides by refractory pieces I. The end pieces of each tier of conduits have small fillets formed on them.

The air circulates from below upwards. It enters, through a regulatable register K, into a chamber C, passes through a grating of refractory bricks D into the lower tier of conduits E, then enters the tier above, and so on in zig-zag until it reaches the burners, where it is utilized. The chambers M, which make the communication from one tier of conduits to the next, are separated from one another by refractory tiles J resting at one side on the fillets of the conduits E, and at the other side on projections made in the masonry and in the wall A. Gratings H, formed of small bricks, equalize the distribution of the air before it enters a tier of conduits.

The burnt gases received into a horizontal collector N at their issue from the combustion chamber descend in zig-zag in the flues F in order to reach the regulatable register O, whence they pass to the chimney. The circulation directed by the partitions P Q is such that a meeting of currents going in opposite directions cannot occur at any point. The illustration shows that the gases circulate in planes perpendicular to the front of the regenerator, while the air circulates parallel thereto in the conduits E.

In the regenerator thus constructed the smoke flues F and the air communication chambers M are easy to examine, clean, and repair through the inspection holes R distributed in the front wall, "and without any inconvenience on the furnace platform." The cleaning may be effected by means of tools of short length. The small depth of the regenerator also allows of reducing the collars necessary when the regenerator is constructed underground.

A convenient arrangement of refractory pieces S allows, when the furnace is stopped, of removing the wall A and tiles J without inconvenience, so as to make a temporary inspection chamber accessible to a man between the two stacks of conduits E. It is thus possible, at little expense, to thoroughly clear the air-conduits E from dust, to repair the interior of the conduits if necessary, and to clean and make good all the passages before recommencing work. Finally, "in a doubtful case this arrangement allows of getting an exact idea of the condition of a regenerator, and consequently of the steps necessary for prolonging its existence."

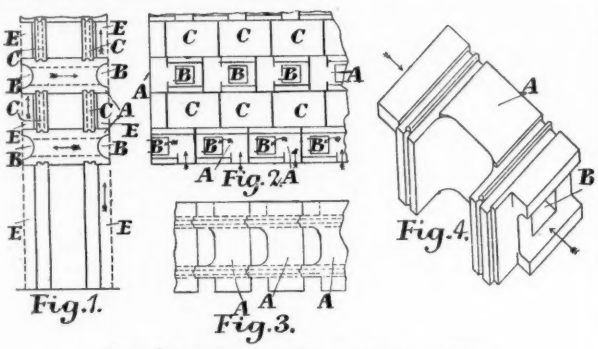
When the inspection is completed, the wall A is rebuilt; the partitions J and H replaced; the opening T in the front is built up again; and the furnace can then be restarted.

Regenerator Flues.

MASON, A., of Derby.

No. 382; Jan. 6, 1911.

This invention relates to the construction of a regenerator flue formed of a number of blocks with tiles between them; the object being "to economize material and labour, and the construction being specially designed for high temperatures necessary for the carbonization of coal in the manufacture of gas."



Mason's Regenerative Flues for Retort-Settings.

Fig. 1 is a front elevation of a small portion of a regenerator flue. Fig. 2 is a side elevation. Fig. 3 is a plan. Fig. 4 is a perspective view of one of the blocks.

The flue is made of blocks A, with an indent or recess on one side and a plain side on the other (with the exception of the jointing grooves). The blocks fit close together on plan and are grooved and tongue-jointed with one another, so as to break all straight joints. On one end are projecting flanges top and bottom and part length of the block; the corners of the flanges being cut away of nearly the same depth as the indent or recess previously mentioned. On the opposite end is a projecting top flange the whole length of the block, and a bottom flange of the same length as the two at the opposite end. There is a flue B passing through the body of the block from end to end—being preferably placed centrally of the shorter flanges above mentioned. On one side of the block is a recess or opening (already mentioned), so that when the blocks are fitted to one another an opening is left between one block and the next, and constitutes, when blocks are laid side by side, a number of waste-gas flues as fig. 3.

The flue through the body of the block is the secondary air passage, and when the blocks are fitted one over the other vertical tiles C are placed between them. These tiles fit in horizontal recesses in the tops and bottoms of the blocks; the recesses being grooved and tongued so as to stop leakage of the secondary air to the waste gases.

Fig. 1 shows the full width of the regenerator flue or chamber; the outer dotted lines on each side indicating the faces of the brickwork, and leaving air spaces E between them and the tiles C. The waste gases pass downwards through openings, which break joint with one another and so cause the gases to take a circuitous route, or be baffled as much as possible, "to utilize the heat therefrom to the best advantage." The secondary air comes up through the openings at the ends of flanges (as shown by the arrows), and passes through the flues B and upwards, backwards and forwards.

Manufacture of Ammonium Sulphate.

VIS, G. N., of Cuise-Lamotte, France.

No. 9609; April 20, 1911.

The patentee, in his specification, says: It is well known that ammonium sulphate is obtained by converting ammonium carbonate with readily soluble sulphates such as alum, as well as with sulphates which only dissolve with difficulty, such as gypsum. Both reactions have been proposed for obtaining ammonium sulphate from gas liquor; the stochiometrical amount of alum being added to the gas liquor in the first method, and the gas liquor being passed repeatedly through a layer of gypsum in the second method. Neither of the two proposals has, however, attained technical importance, and in practice ammonium sulphate is prepared now, as before, by the reaction of ammonia vapours on sulphuric acid.

The present invention relates to the last mentioned process—that is, the production of ammonium sulphate by the conversion of ammonium carbonate with gypsum.

The invention broadly consists in carrying out the well-known reaction between ammonium carbonate and gypsum in concentrated solutions for the production on a manufacturing scale of ammonium sulphate, which is said to be obtained in solutions of at least 30 per cent.; and preferably essentially higher strength, by adjusting the amount of water and the temperature.

As an example of carrying out the invention, ammonium carbonate in any suitable form is dissolved in water. The concentrated solution is brought together with gypsum in a finely-pulverized state. The reaction can be observed by a thickening of the whole mass; and after a short time calcium carbonate is precipitated, whereas the ammonium carbonate has been converted into sulphate. If the ammonium carbonate has been employed in the form of an acid salt, carbon dioxide is briskly evolved; and the solution contains, besides a little calcium bicarbonate (which can be decomposed by boiling), only ammonium sulphate.

Another very advantageous way of carrying out the process is the following: Gaseous carbon dioxide, for instance, in the form of furnace gases (with 10 per cent. to 15 per cent. of carbon dioxide) and ammonia vapours, for instance, derived from the waste waters of gas-works, and the like are passed through a suspension of gypsum of any suitable source. The reaction is carried through in such manner that it corresponds to the following equation:—

$$2NH_3 + CO_2 + CaSO_4 + xH_2O = (NH_4)_2SO_4 + CaCO_3 + yH_2O.$$

However, an excess of carbon dioxide is employed, in order to avoid ammonia being carried away by the escaping inert gases. In this case, also, the amounts of gas and water are regulated in accordance with the temperature; so that a concentrated solution of ammonium sulphate is obtained of at least 30 per cent. and preferably essentially higher strength.

A still further way of carrying out the process consists in leading a solution of ammonia in water as concentrated as possible—such as is obtained from the stills of gas-works—into a thick suspension of gypsum, into which at the same time carbon dioxide or furnace gases are passed; care being taken that the carbon dioxide is always present in excess.

The gypsum is kept in suspension by means of stirrers; and, if necessary, calcium bicarbonate present in the solution obtained is decomposed by boiling. The whole mass is then passed through a filtering press, and the clear solution is evaporated to give ammonium sulphate. The aqueous solution of ammonia is employed in as concentrated a form as possible—*i.e.*, of the specific gravity ·920 to ·890. There is usually present in the resulting solution (according to the temperature of operation and depending on the amount of water added initially to form the gypsum emulsion) 70 to 85 parts of ammonium sulphate per 100 parts of water.

APPLICATIONS FOR LETTERS PATENT.

29,097.—AKT-GES. BROWN, BOVERIE, ET CIE., "Gas-turbine." Dec. 27.

29,127.—GILL, G. M., "Mechanically-operated poker for retort-furnaces." Dec. 27.

29,140.—THIEM, W., "Valves for gas-conduits." Dec. 27.

29,164.—CULLING, P. E., and SPREADBURY, E. L., "Adjustable gas-pendants." Dec. 28.

29,200.—HUTCHINS, T. W. S., "Operating producer-gas power installations." Dec. 28.

79,211.—INGENIORSFIRMA FRITZ EGNELL, "Gas-analyzing apparatus." Dec. 28.

29,215.—RUDOLPH, C., "Flexible pipe junctions." Dec. 28.

29,220.—GRAIGOLA MERTHYR COMPANY, LIMITED, YEO, F. C., and GOSKAR, T. A., "Artificial fuel." Dec. 28.

29,227.—THOMPSON, T., "Combination gas stoves and fires." Dec. 28.

29,244.—FIELDING, J., "Gas-producers and furnaces." Dec. 29.

29,249.—DUTCHMAN, E., FAWCETT, A. S., JESSOP, S., and TRAVIS, W. J., "Automatically lighting, regulating, and extinguishing gas." Dec. 29.

29,263.—LINDQVIST, F. W., "Igniting-device." Dec. 29.

29,288.—TALBOT, J., "Measuring the flow of fluids." Dec. 29.

29,299.—SHARP, W. E., "Gas heating-devices." Dec. 29.

29,343.—FRICKER, E. H., "Atmospheric burners." Dec. 30.

29,345.—SMITH, H., "Gas-stoves." Dec. 30.

Wages in the Oldham Gas Department.—The Oldham Town Council have approved a recommendation of the Gas Committee advancing the wages of assistant storekeepers in the employ of the Department from 27s. to 28s. per week. The tinplate workers engaged by the Gas Department are to have their rate of pay advanced from 36s. to 38s. a week, if other employers in the town give a similar increase, as demanded by the Tinplate Workers' Union.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Gas Publicity Movement—Help from the Antipodes.

Sir,—At the last meeting of the Provisional Committee of the British Commercial Gas Association, a letter from the Secretary of the Metropolitan Gas Company of Melbourne was communicated. As it deals so effectively with the question of publicity, it was decided to ask permission for its publication; and a message has just been received from Melbourne giving this permission.

The Committee will feel much obliged if you will insert the letter in your next issue, together with some appropriate remarks upon it, which they trust may have the effect of deciding some of the British companies who have not yet consented to assist the movement, to do so.

39, *Victoria Street, S.W., Jan.* 3, 1912. W. T. Dunn, Secretary.

[Enclosure.]

Walter T. Dunn, Esq.,
Secretary, Institution of Gas Engineers.

Dear Sir,—My Directors, who have had brought under their notice by the Engineer to this Company (Mr. P. Holmes Hunt) the scheme for co-operative publicity work in Great Britain, initiated under the auspices of the Committee formed from your Institution and the Joint Commercial Sections of District Associations of Gas Engineers and Managers, have given consideration to the question of according financial assistance to the movement.

It is recognized that much of the work to be performed, and the matter to be published, will be framed on lines calculated to meet the demands of the gas undertakings in the United Kingdom, and for this reason may not be altogether applicable to our special requirements in Melbourne. At the same time, my Directors are assured that the publication of information having for its object the education of the community in matters pertaining to the use of gas, both from a hygienic and an economical point of view, and the refutal of the many misstatements circulated by its opponents, must, in the long run, prove of considerable advantage to the gas industry wherever situated.

For this reason, and in order to show its sympathy with, and to accord its support to, a movement of which it cordially approves, my Board has decided to contribute a sum of £100 per annum for three years to the Publicity and Special Purposes Fund now being raised. At the expiration of this period, it is proposed to give further consideration to the matter, in view of the experience as to results which will, by then, be at our disposal.

After making allowance for the varying local conditions under which this Company is working, we shall doubtless be able to derive some benefit and assistance from the work emanating from the Committee in our efforts to extend the use and promote the sale of gas in Melbourne; and to this end I would ask that we may be favoured with copies of such publications or any suggestions which may, in your opinion, be considered suitable to our requirements.

We observe from an issue of the "Journal of Gas Lighting" recently to hand, that the formation of the British Commercial Gas Association, to carry out the publicity programme on well-defined lines, had been proposed; and it is likely, therefore, that the new body will by this be an accomplished fact, and will have entered upon what it is hoped will be a useful and successful career.

A cheque for this Company's first year's subscription will be available in due course, on application to Messrs. John Terry and Co., of 7, Great Winchester Street, London, E.C.

(Signed) John Hinde, Secretary.

Metropolitan Gas Company, Melbourne, Nov. 16, 1911.

[Allusion is made to this letter in the leading columns of the "Journal" to-day.—Ed. J.G.L.]

Coke for Domestic Use.

Sir,—Referring to your "editorial," on Professor Vivian B. Lewes's last Cantor Lecture, in this week's issue, I am much interested in the often-discussed question as to the advantages of a supply of more suitable coke for household fires in large towns, the chief of which being the reduction of the soot, smoke, and fog troubles. Since soon after I came to live in this city in 1908, I practised the use of a mixture of "coalexld" and coal for domestic purposes, and can testify to a great reduction in the quantity of smoke given off, as evidenced by the change in the condition of the chimneys. The local coals, which are generally consumed, are very "smoky;" and the soot trouble is consequently very troublesome.

I am not sure as to the advantages claimed for "coalexld," compared with ordinary gas coke, but am inclined to believe it is easier to burn. In any case, "coalexld" is not my ideal fuel.

Unfortunately, "coalite" has not been successful on economical grounds. But I feel confident that the gas companies could without loss provide a more suitable fuel than their present quality of coke; and if they took some pains to introduce it to the notice of consumers, they would find it to their advantage to produce such a fuel—at first a small proportion of their make—increasing the quantity as the demand increased.

Gas-fires are no doubt more cleanly and less troublesome, and may have other advantages; but it will be a long time before the British public will have gas-fires in their living rooms generally.

Even where there is a good market for gas coke for works purposes, I believe the experience is that, by cultivating a market for it among householders, in competition with coal, more money can be realized by selling it in small quantities.

The Tarless Fuel Syndicate (who have works near London) and the British Pure Fuel, Limited (with works near Burton-on-Trent), are working in this direction; but I do not believe much headway can be made unless gas-works take the matter up.

You have probably read the letter published in "The Times" from Mr. Kenneth R. Swan, dated Dec. 27;* and there is no doubt that there is a very large number of people who would welcome the introduction of such a fuel as referred to, and would do a good deal in the public interest to push the use of it, if available.

Richard Jones,
Coke-Oven Construction Company, Limited.

Howard Chambers, Sheffield, Jan. 5, 1912.

* See p. 101.

The Comparison of Costs of Lighting by Gas and Electricity.

Sir,—It is now proposed to deal with that portion of your article which criticized severely the figures which I submitted. I wish to make it clear that I had made every endeavour to ascertain the true facts concerning the lighting costs. The figures which you have provided are not convincing, for the following general reasons.

Let us take the question of the cost of compressing. Mr. E. W. Smith gives it as 2s. per 1000-candle power, 800 hours. Mr. Farquahar seems to ignore it. The Water-Cress Mission plant is on a basis of 12s. per 1000-candle power, 800 hours. The draper's shop you quote, in London, is 8s. (approximately). My figure was 8s. So on this point, at any rate, we seem to both strike somewhere of a mean between us and Mr. E. W. Smith and the Water-Cress people.

I now take your figures for the draper's shop in London. The figures for electricity seem to be hopelessly mixed up. Five of the 10-ampere flame arcs in series of 220 volts, with electricity at 4½d. per unit, would come to (all in) about £57 per annum. For inside lighting, 3232 units, at 4½d. per unit, would come to (say) £15. Replace all of the lamps once a year, 45 at 3s. 6d. (say) £7 10s. [I believe that the Osram lamps are now 3s.; but we will let the above figures remain.] This then gives the total price £79. In view, too, of the figures given by Mr. Farquhar, showing 34s. per lamp per annum as the cost of maintenance, would it not make the schemes more comparative if, instead of £17 6s. for maintenance, there were written £49 6s.—raising the cost of the gas scheme to £103 10s. 4d.?

I now come to deal with the Water-Cress Mission. Here you are comparing an old installation of electric lighting with a new gas installation; and, as far as I can ascertain, the figures given are all refuted by the electrical engineers. The average watts per candle are 2½. Useful maximum beams can be sent out at about 0·5 watt per candle.

There are no figures of actual illumination; and, on your own showing, the light from large units is not so good as the light from small units. Barely 1000 candles of the electric light properly placed would give the same effect as 3000 candles in large units as suggested. It is, of course, claimed by the electrical engineers that the capacity of the rooms is decreased by the use of gas. The theatre proprietors seem to think so; and this appears to be the view of the factory inspectors. You must also bear in mind the question of decorating and cleaning.

Woolwich Shop Lighting.

I must here maintain that, from the figures given, electricity is cheaper than gas. I have endeavoured to do so, but cannot trace the *replacing*. The numerous gas-lamps are accounted for by the fact that, so far as I can calculate, the gas is being sold at what appears to be an unsound commercial proposition. At any rate, I cannot get it out at anything like the figure it is sold to householders.

The statement that the prices asked for are not uniform, seems to be an admission that the low figures are not on a commercial basis. The contract system of hire maintenance is an attractive one; and there is no doubt that the fact that single gas-lamps can be erected is also attractive. Engineering and Arc Lamp, Limited, of Chingford, Essex, guarantee that their flame arcs, at 4½ amperes, of 225 watts per lamp, five lamps in series on 250 volts, give about 800-candle power.

With reference to the combined working scheme, it should be mentioned that in Bermondsey twenty of these lamps are used for a whole series of small shops. Each shop pays its share. As for my omission of the voltage, that criticism was weak, as the figures following gave it at once. The carbons given were those of an actual set of lamps.

While dealing with the Woolwich figures, it should be mentioned that the three top arcs certainly do not contribute 10 per cent. to the point of the pavement taken by me; and they are obviously placed there for other purposes than that of shop lighting.

Surely Mr. Bradley's figures refer to high-pressure inverted mantles! I have never seen the 985-candle power upright lanterns, and suppose it would take some fifteen mantles to get it.

Mr. Farquahar's figures are, I am afraid, not very convincing. Because the gas-main costs nothing, and because he makes his own gas-brackets and they cost nothing, and the service costs nothing and the brackets never want painting, and so on.——Well, I am not persuaded by such arguments. Lamps put up three years ago directly under my notice have been taken down; and I really think a stronger case than Mr. Farquahar's must be presented as a general one.

The whole question of the variation of candle power seems to be begged. You get 25-candle power in a good type burner, and 40-candle power in another type. But it is possible to do better than this. Early in the evening, one can adjust a burner to give (say) 100 per cent. light; but an hour later it is giving 50 per cent. light. Adjusted again, and two hours later there is not the same candle power. In this matter of the calorific power, I very much sympathize with the gas manufacturers, who have been handicapped by legislation. But it is better to bravely face the fact that it exists, and to try and get it altered, than to ignore it.

Metal Filament Lamps.

Again, here I must point out at once that I did not say that metal filament lighting was cheaper than high-pressure gas. It is quite obvious that no company will lay high-pressure mains in dwelling-houses.

There are two points which must not be overlooked. These are—

(1) That the test-bed efficiency figures are really no criterion, and
(2) That the efficiency of the mantle *does* deteriorate.

My original electrical figures here are quite within those obtained by experience.

It is, of course, very probable that you will handle these figures

somewhat severely. At the same time, it is right to say that they are advanced quite impartially. I have gone to a very great deal of trouble during the whole of this correspondence to try and get at the facts; and it is only right that I should take this opportunity to thank you for stimulating me to make inquiries among gas engineers, and also for affording me the hospitality of your columns. I trust that in no case will either the gas or the electrical engineers think that I am their natural enemy. My first duty is, of course, to the general public, and to the great journal upon whose staff I am privileged to serve.

I am extremely anxious that all applied science work, and its importance to the country, should be brought to the notice of the general public. The British Commercial Gas Association is in the somewhat narrow field of gas engineering, about to do work which I initiated with regard to engineering ten years ago. I hope that both this Association and all similar Engineering Associations will do active work.

Finally, I beg to thank you for the absence of any personal abuse which would have degraded this controversy.

"ENGINEERING CORRESPONDENT" OF THE "DAILY TELEGRAPH."

Jan. 4, 1912.

[The foregoing letter and the previous one by "Engineering Correspondent," reply to which latter we deferred until we had his complete statement, will form the subject of an editorial article in next week's issue. The partial, we will not yet claim complete, reversal of the views of "Engineering Correspondent," as the result of this controversy," will be seen from the article reproduced from the "Daily Telegraph" of yesterday's date. Perhaps after our next article, there will be—at any rate we modestly hope so—a few more points which our friend will consider had best have been left unsaid in his "Golden Lights" production.—ED. J.G.L.]

LEGAL INTELLIGENCE.

A Builder and his Water Supply.

At Doncaster last Wednesday, Judge Allen heard a claim by Mr. Abner Carr, a builder and contractor, who sought to recover from the Doncaster Corporation damages for breach of an arrangement for the supply of water for building purposes, last June, to two houses and shops. It appeared that prior to June 13, the plaintiff had taken water for building purposes from a domestic service supply pipe of a neighbouring house, and had fixed a tap on the pipe, and made a connection. This he did without having previously obtained the consent of the Corporation, in professed pursuance of a custom which had prevailed in the district for some years, though what he had done was contrary to the bye-laws and regulations. The Corporation served him, among other builders, with a notice calling attention to the fact that water had been wrongfully taken for building purposes without permission, and stating that any person who did so after receipt of the notice would be prosecuted. After this (on June 13) plaintiff called at the Corporation offices, and saw Mr. Proctor, the clerk in charge, who supplied him with an application form for a supply of water, which he filled in, and received a receipt for £1 10s., the amount of the charge for the water. On June 15, the Surveyor refused to allow him to have a supply until proceedings, which were being brought against him, for wrongfully taking water, had been determined by the Magistrates. His Honour said he thought the evidence showed that, whatever the limits of the authority of Mr. Proctor might be, he was held out by the defendants as a person who had authority to make an agreement on their behalf for the supply of water for other than domestic purposes, and that they could not now say he was not their agent. It would be observed that the Corporation retained the money paid by the plaintiff. It was contended by the defendants that, even if there was an agreement binding on them, there had been no breach, as they had supplied the water as soon as they conveniently could, which was all they had agreed to. He held that the Corporation could have conveniently supplied the water on June 15, and that they did not do so till June 27; and he assessed the damages at 30s. Judgment was entered for the plaintiff with costs; and leave to appeal was granted.

Projected Gas Extensions at Darlington.—In the Darlington Town Council, Alderman Barron, referring to extensive alterations which are contemplated at the gas-works, said that the whole question had been fully considered by the Committee; but it was advisable that details should not be published at the present stage. On his suggestion, the proposal that the work be carried out, and that the Committee be empowered to enter into the necessary contracts, was referred to the General Purposes Committee. Mr. Wooler asked if the Committee had considered the desirability of manufacturing "perfumed water gas" before embarking on this large expenditure. Alderman Barron, after inquiring whether there was any special kind of perfume the Councillor would like, pointed out that they had obtained a big holder to provide storage, in order to avoid having to resort to water gas.

Birmingham Gas-Works Contracts.—The Gas Committee of the Birmingham Corporation have entered into a contract with the Koppers Coke-Oven and Bye-Product Company for the supply of twelve horizontal chamber ovens, with Messrs. W. J. Jenkins and Co., Limited, for a coke-quenching machine, and with Mr. J. Thompson for a Lancashire boiler—all for the Saltley works. At the Swan Village works, Messrs. Gibbons Bros., Limited, have been entrusted with the reconstruction of a retort-house; and at the Adderley Street works, the Bryan Donkin Company, Limited, are to put in a "Rateau" fan, motor, &c. The following contracts have been placed for the Windsor Street works: Messrs. Belliss and Morcom, Limited, for a gas compressor; Messrs. Head, Wrightson, and Co., Limited, for a furnace ash and breeze washer, hoppers, screens, &c.; Messrs. Humphreys and Glasgow, for two blast products purifiers for the water-gas plant.

MISCELLANEOUS NEWS.

GASLIGHT AND COKE COMPANY'S CO-PARTNERSHIP.

The Governor's Greeting for the New Year.

The first number of the second volume of the "Co-Partners' Magazine" of the Gaslight and Coke Company, a copy of which we have received from the Secretary (Mr. H. Rayner), contains the following greeting for the New Year addressed by the Governor (Mr. Corbet Woodall) to his "co-partners and friends."

At the opening of a New Year I wish you health and good success, and am glad to congratulate you on the prosperity of co-partnery. May it continue to flourish, conferring benefits all round. It is this "all round" benefit of co-partnery which should especially commend it. We hear it said so often that labour and capital are opposed, unsympathetic; and doubtless many illustrations can be advanced to support the statement. The buyer and the seller also regard each other with suspicion and distrust. Co-partnership alone brings capital and labour, producer, buyer, and seller into one harmonious whole; like the members of the body, of which we are told: "There should be no schism in the body; the members should have the same care one for another, and whether one member suffer all suffer with it, or one member be honoured all the members rejoice with it." That exactly expresses our case. If the Company is successful, then consumers, workers, shareholders can rejoice together; but no one section can prosper without the other. All must pull the same way in a co-partnery team.

This reads rather like a sermon, and the New Year is responsible. We think over the past at this season, and consider the possibility of improvement.

As you know, we are, as a Company, entering upon not only a New Year but a New Century. A hundred years have passed since the Chartered Company was formed. Son has succeeded father in the service; and generations have worked and passed away, while the Company, through evil as well as good times, has grown and prospered. All the great expectations of its founders were not realized; but the most sanguine of them could not have contemplated that the seed they sowed would yield so great a harvest, or the service they started become so necessary to the community as our work is to-day.

I hope we shall all, proud of our Company, strive our utmost to give it a future even larger and more successful than its past.

HAMPSTEAD PUBLIC LIGHTING SCANDAL.

Resignation of the Chief Electrical Engineer.

We learn from the "Hampstead and Highgate Express" that the Chief Electrical Engineer of the Hampstead Borough Council (Mr. G. H. Cottam) has placed his resignation in the hands of the Lighting Committee, who will, it is understood, recommend the Council at Thursday's meeting to accept it as from the 12th of July—that is, six months from the day after that meeting. It is also understood that the Committee will recommend the Council to ask the Finance Committee to consider the question of granting a superannuation allowance to Mr. Cottam on his retirement. Referring to this proposal, which, if adopted, would give a pension of £200 per annum to one of the electric lighting officials at fault in connection with the recent public lighting scandal, Mr. H. T. Hill, in a letter to the above-named paper, says a canvass has been instituted among the councillors with the view of carrying a vote to this effect. He thinks such a procedure considerably accentuates the scandal. In its present state, it is quite bad enough, he says, for the ratepayers to suffer without the burden being added to. He asks: "Is it not high time the Local Government Board stepped in?"

Demand for a Local Government Board Inquiry—Electric Lamp Deficiencies.

The question asked by Mr. Hill at the close of his letter is one which not a few ratepayers are now putting. One of them, whose letter appeared in the "Express" last week, wrote: "Surely this is a case which, together with all its facts, from the inception of the plan to oust the Gas Company, who were serving us well, down to the present, should be laid before the President of the Local Government Board for a full and complete inquiry, for he has, I understand, the power to refuse to sanction this excess being put on the rates or paid out of reserves.

Letters from Mr. Abady and Mr. Keith.

Mr. Jacques Abady sent the following letter on the subject to the Editor of the "Express."

Sir,—I venture to intervene in the discussion on the Hampstead lighting scandal for the following reasons: (1) Because I have been for some years, and am now, a resident ratepayer. (2) Because I have served for some years, and am now serving, as a municipal councillor in London. (3) Because I am supposed to possess some knowledge in matters relating to lighting. I can therefore speak as a ratepayer with an intimate knowledge of the powers, duties, and responsibilities of councillors.

Your readers may not be aware that under section 8 of the London Government Act of 1899 no expenditure exceeding £50 can be incurred, and no payment can be made, unless it is passed by a Council upon a recommendation brought forward by the Finance Committee. It therefore follows that both the original estimates and the payments for this street lighting conversion must have come through both the Committee initiating the expenditure, the Finance Committee, and the Council; and this applies to every item exceeding £50. Yet we are told that the falsity or error in the estimate of expenditure and account or supposititious cost for the first conversion of lamps, which was about £400 out, was not discovered until some eighteen months after-

wards! Your readers may also not be aware that, under certain circumstances, the Local Government Board Auditor has power to surcharge councillors—*i.e.*, to make them pay out of their own pockets for their own neglect, and, one might almost say, errors of judgment.

Now, taking the above statements together—*i.e.*, considering the responsibilities of councillors in conjunction with the powers of the Local Government Board Auditor—I have not the slightest hesitation in stating that this lighting transaction is essentially a matter to be investigated at a Local Government Board inquiry; and I suggest that the Committee it is proposed to form should devote its energies to this end.

Your correspondents have dealt more or less fully with the question of the capital or initial expenditure, while the report of the Business Committee (if your transcript is a full one) only deals with this aspect. I do not see anything in this report which affects the responsibility of the Lighting and Finance Committees and of the councillors generally; and I should like to know what the Committees in question or the councillors (who at election times claim to be heaven-sent guardians of the public purse) have to say with regard to the annual cost of lighting, upon which the report is silent. They surely know the truth now. Let truth out.

I therefore put the following questions:

1.—Is it or is it not a fact that the offers of the Gas Company (assuming they were treated seriously) were compared in the Lighting Committee's report with an electric light of 56 candles, which it was alleged would be provided by two 35 watt lamps?

2.—Is it or is it not a fact that the light of the majority of the lamps is and can be demonstrated to be considerably less than 56 candles, not because 70 watts will not yield approximately 56 candles, but because the lamps are so badly kept and because in many cases it has been found necessary to save current by substituting for one lamp of 35 watts a lamp of less wattage and therefore less candle power? In other words, is it not a fact that the provision of 56 candles in many lamps is not being given?

3.—Is it or is it not a fact that the Committee were in the first instance informed of the annual cost of providing 56 candles (70 watts) irrespective of capital charges, and that these costs are quite easy to check by anyone with the electricity costs before him and an elementary idea of the cost of new lamps and general maintenance? This being so, what explanation, as men possessed of ordinary intelligence, have the councillors to offer as to why they deceived themselves and their constituents by allowing the reduced offers of the Gas Company to be met by reduced paper departmental estimates of annual cost?

4.—If the first departmental estimate of annual cost was correct, how could it be possibly reduced, even on paper, except at the cost of the ratepayers? In other words, why did the councillors allow to be put forward what everyone must have known to be purely fictitious and fancy estimates of the cost of 56 candles per lamp per annum?

5.—Is it or is it not a fact that this impossibility of providing the light for the money has materialized in the substitution of lamps of less wattage and candle power than was promised to the ratepayers?

6.—Will the Council let the ratepayers know the wattage that is being provided in the lamps, and what each one actually costs for current, lamp renewals, and general maintenance; and will they put side by side with this statement the price quoted by the Gas Company (also exclusive of capital expenditure) for a guaranteed candle power of 60 candles?

It must be apparent to all ratepayers that, from a business point of view—and every ratepayer is a shareholder in the electricity undertaking—the public lighting is about the worst advertisement for the department there could possibly be.

I think the questions I have set out should be put and answered at a Local Government Board inquiry. If the councillors have, after all, done an excellent stroke of business for the ratepayers, they should have the credit for it; but if not, the matter should not rest by the sacrifice of two officials who either acted with the tacit consent of the Committee (I imagine) or from a mistaken sense of zeal. Nor should there be an acquittance from blame of the officials' masters—viz., the councillors—unless an inquiry shows them to be blameless.

Mr. George Keith, who resides in Sarre Road, West Hampstead, wrote as follows on the deficiencies of the electric lighting:

Sir,—As one of the ratepayers of Hampstead, I am naturally interested in the question of the cost of converting the original gas-lamps into the present electric lamps; but it appears to me that, quite apart from the gross under-estimate of the cost of installing the present system, it is at least of equal importance that the cost of running and maintaining these lamps should be investigated and compared with the estimated cost.

One of your correspondents made a very pertinent remark on this latter head, as it is quite as likely that the working costs of these lamps would be under-estimated as was the cost of conversion, in face of the competition of the Gas Company's offer. It will therefore be very interesting to learn how the actual cost comes out.

Another very important point is that, apart from the initial cost, the light given by the lamps can only be described as wretched, and reminds one of the old days when flat-flame burners were used.

As the writer is a practical photometrist, he—together with an assistant—tested eight of the lamps in Sarre Road last night [Dec. 27], by means of one of the latest type of illumination photometers—viz., Beck's holophane lumeter—used in such a way as to give the candle power of the lamps at an angle of 45°; and the results as given in the table below will, I venture to think, furnish some food for thought, as they astonished even the writer.

The angle of 45° was taken as being the most convenient for working; and, although possibly a slightly higher candle power could have been obtained by taking a reading at an angle nearer the horizontal, there is still plenty of margin for improvement. In order to avoid error, the lumeter was carefully calibrated, both before and after making the tests, by means of a 10-candle standard Harcourt pentane lamp, which lamp had been verified by the National Physical Laboratory. I need not go into details here as to how the test was taken; but I am quite prepared to give these to anyone interested. As an actual fact, the readings given below are 10 per cent. higher than those actually obtained, as this was put on to make a liberal allowance for a slight haze which was about at the time of the test, though this was insufficient to obscure the moon and stars.

The lamps were each tested on two sides, and three readings were taken in each position, and the average of these three readings is given. In the first column, the figures are those taken looking along the kerb. The second column gives the figures taken from the roadway at right angles to the first position. Where the figure has an asterisk against it, this indicates that the particular side of the lamp on which the test was made had a pane missing, which, owing to the dirty state of the glass generally, gave a slightly higher candle power than it would otherwise have done. But even in such cases the candle power was miserably low.

It is understood that at present in each lantern there are fixed two 30-watt lamps, and the light claimed for these lamps is one candle power for 1¼ watts. Therefore they should be giving at this rate 48 candles per lantern.

No. of Lamp.	Reading from Kerb.	Reading from Roadway.	Average.
1	18·15	19·80	18·97
2	27·50	20·70	24·10
3	18·70	19·80	19·25
4	19·00	19·80	19·40
5	17·60*	16·50	17·05
6	16·50	21·40*	18·45
7	17·60	19·80*	18·70
8	17·60	15·95	16·77

Another point to which attention should be drawn is the disgraceful condition into which these lamps are getting; and, if care is not taken, in many instances there will, in a short time, be no lamp at all. It would appear that, instead of replacing panes of glass as they have become broken, the broken pane has simply been removed, so that it is scarcely possible to walk along the streets of Hampstead in the part where the writer lives and find a lamp with the four complete panes in it. Quite a number of the lamps have no panes left at all.

The result of this state of affairs is that, as this type of lantern depends a great deal on the glass to maintain its rigidity, in such lanterns which have one or two panes left the effect of the recent heavy winds is distorting the lamps, so that they have a most decrepit appearance. The original reflectors (which were, I believe, enamelled steel) were painted with white paint at the time of the conversion; but at the present time they are of a dirty brown colour—certainly quite useless as reflectors, which I think the results given in the above table will confirm.

It would appear to the writer that, apart from all the other considerations mentioned, in order to admit of such poor results being given by the lamps there must be some considerable drop in voltage in the supply, so that the lamps are not getting their proper quantity of current. Is it possible that the cables which were laid specially for these lamps were skimped in their capacities in order to try and keep down the cost of converting to as low a figure as possible? If this is the case, even should it be decided to put in larger lamps than those at present in use, the existing cables will not be large enough to carry the current for them.

In its present state, the lighting of Hampstead is a positive disgrace to any Council, and is giving great dissatisfaction to the residents.

BROMLEY AND THE GAS AMALGAMATION.

At a Meeting of the Bromley Town Council last Tuesday, the General Purposes Committee, in their report, stated that the Town Clerk (Mr. F. H. Norman) submitted a report on the provisions of the South Suburban Gas Bill, promoted to authorize the acquisition by the Company of the undertakings of the Bromley and Crays Gas Company and the West Kent Gas Company. It appeared from the report that there were several matters upon which an amendment of the Bill was desirable in the interests of Bromley. A letter was read from Messrs. Baker and Co. on the same subject, suggesting a conference of the various authorities affected by the Bill. It was resolved to recommend that the Council oppose the Bill.

Alderman JAMES referred to some of the reasons that induced the Committee to recommend the Council to oppose the Bill, and to points in which, in the opinion of the General Purposes Committee, Bromley's interests needed to be safeguarded. Section 32 dealt with the price of gas in the Bromley district, and section 37 gave the South Suburban Gas Company power to lay mains in any street laid out, and not dedicated to the public use, as if the streets were streets within the meaning of the Gas-Works Clauses Acts of 1847 and 1871. The question of the price of gas, he ventured to say, touched everybody in the district; and if fresh parliamentary powers were asked for, it was the duty of the Council to see that the interests of the residents of Bromley were thoroughly safeguarded It was quite impossible to do this unless they got *locus standi* in the House of Commons at the Committee stage, to ascertain, in the first place, what the contention of the Gas Company was in regard to any particular clause, and, secondly, to watch what possible amendments might be made. With regard to suggested powers with reference to the roads of the borough, he was sure they would agree with the General Purposes Committee that whatever powers were sought in this direction should only be granted so as to be compatible with the powers that already existed, and with which the Gas Company in the past had had to comply, and other companies still had to comply.

Mr. NEWTON wanted to know what the cost of opposing the Bill would amount to.

Alderman JAMES contended that this was not the attitude to adopt. The question of cost was hardly one to be considered in such a case. The real question was the interests of the inhabitants of Bromley. They were there as trustees for the inhabitants, and were forced into the position, he took it, of opposing the Bill in Parliament. He did not think it wise for the Council to lose their chance by leaving it until it was too late.

The report of the Committee was adopted.

MALLOW GAS PURCHASE ARBITRATION.

Amount to be Paid for the Undertaking.

In the issues of the "JOURNAL" for Dec. 19 and 26 (pp. 847, 927) a report appeared of the four days' proceedings, at the Westminster Palace Hotel, in an arbitration to determine the price to be paid by the Mallow Urban District Council for the undertaking of the Mallow Gas Company. The arbitration arose out of the Council's Act of 1910, which gave them power to compulsorily acquire the concern. Mr. Christopher C. Hutchinson acted as sole Arbitrator; and he has now made his award, under which the sum to be paid for the undertaking is fixed at £7359.

As the facts and figures were fully set forth so recently in our pages, it is unnecessary to repeat them again now. In addition to the engineering evidence, the witnesses included Mr. R. Bruce Anderson (the Secretary, Engineer, and General Manager of the Company), Mr. William Cash and Mr. C. F. Spencer (the Accountants acting respectively for the Company and the Council), and Messrs. Edward Fitzgerald and Thomas Wrixon (Chairman and Clerk to the Council). For the Company, Mr. Frank Jones put in a valuation amounting to £11,824, in which he had not dealt with the question of an allowance for compulsory purchase, or of the reversionary interest in connection with Mr. Anderson's agreement with the Company, but had included £1000 for surplus works. Mr. Henry Woodall's valuation (without the allowance for compulsory purchase or any reference to future saving in respect of Mr. Anderson) came to £11,603. On behalf of the Council, Mr. William Newbigging put in a commercial valuation of about £4700; and Mr. John Lyne, of Wexford, stated that he agreed with this evidence.

THE LATE BARKING GAS COMPANY.

Two Presentations.

By invitation of the Directors of the late Barking Gas Company (which has now been absorbed in the undertaking of the Gaslight and Coke Company), the officials and employees, to the number of about a hundred, sat down to a farewell dinner at the Red Lion Hotel last Wednesday. Mr. W. B. Reidie (the Manager and Secretary) presided; and among those present were Mr. W. Cheesman (Assistant Secretary), Mr. W. Barnett (Auditor), and Mr. J. Sheridan (Assistant Manager), the guests including Mr. J. Griffin (formerly Manager of the works).

In proposing the toast of "The Directors of the Barking Gas Company and Mr. Reidie," Mr. Barnett referred to the loyalty of the staff, and added that he thought the shareholders and the public, as well as the employees, had been fortunate in having on the Board of Directors gentlemen of integrity, whose every wish was to further the welfare of the staff. Under Mr. Reidie's able management, the Company had gone on and never looked back; and to-day in Barking they looked upon electricity as simply an outside thing and a burden on the rates. All in Barking knew Mr. Reidie, and knew his worth.

In returning thanks, Mr. Reidie said it would be a pleasure to him to convey to the Directors the good wishes and expressions of gratitude of the staff. From a newspaper cutting, he saw that on the first night in 1839, when the Barking Gas-Works were opened, there was a balloon ascent in the town to celebrate the event. In 1861 the gross revenue of the Company was £993; while for the year ending June, 1911, it was £36,110. The six months just closed showed a great increase on the corresponding period last year; so he thought he might say they had handed over to the Gaslight and Coke Company a good going concern. He earnestly hoped that the amalgamation would be for the good of all of them, and especially of those who had worked hard to get the Company into the position it now occupied. As they were probably aware, he was going to take charge of the Stratford station of the Gaslight and Coke Company on Feb. 1.

Mr. Cheesman said he was entrusted with the very pleasing task of telling Mr. Reidie of the esteem and affection in which he was held by the staff and the men; and they had shown it in a substantial form by subscribing for the very fine portrait of Mr. Reidie which they saw at the end of the room. He also had the pleasure of saying that this was accompanied by a present for Mrs. Reidie, in the shape of a brooch. This matter had been quite unanimous. Everyone had expressed the strongest affection possible for Mr. Reidie.

Mr. Reidie said words failed him to adequately express the gratitude he felt. If he had been asked to choose, he could not have selected anything better. He thanked them heartily, both on behalf of his wife and himself, for their handsome presents.

Mr. Sheridan then, on behalf of the staff and employees generally, asked Mr. Cheesman's acceptance of a smoker's cabinet. He remarked that Mr. Cheesman had been a great help to everyone; and they all wished him good luck and happiness in his retirement. They hoped he would live long to use the present.

Mr. Cheesman, in returning thanks, said the parting was a sad one; but he would always have the gift to remind him of the many friends he had left behind.

During the evening, a long and enjoyable programme of songs, &c., was gone through; and before the company dispersed, Mr. Reidie handed to each of the employees a packet containing a week's wages, as a present from the Directors. He also announced that nearly the whole of the employees, as well as several of the staff, were going over to the Gaslight and Coke Company.

The "Financial News" says: "Quite a number of small gas companies are being registered. So long as the parties who form them are finding the money, well and good. If not, it will be necessary once again to recall the disastrous record of the small gas company from the point of view of the investor."

BELFAST GAS-WORKS EXTENSIONS.

Opposition to the Scheme.

A Special Meeting of the Belfast County Borough Council was held on Monday last week—the LORD MAYOR (Councillor R. J. M'Mordie, M.P.) in the chair—to confirm a resolution passed at a previous special meeting as to the promotion of a Bill to confer upon the Corporation further powers in respect of their gas undertaking.

The TOWN CLERK (Mr. R. Meyer) read the notice convening the meeting and then said he had received a letter to the effect that at a large and representative meeting of manufacturers and merchants, whose businesses were situated in the immediate neighbourhood of the proposed extension of the gas-works, it was resolved to strenuously oppose the scheme. The writer of the letter was acting as Secretary *pro tem.* of an Association which had been formed, and he had been instructed to request the Council to receive a deputation on the subject.

The Standing Orders were suspended, and the Council decided to hear the deputation.

Mr. G. INGLIS, on behalf of the Association, said they represented the linen, mineral water, bread-making, and other industries whose business interests would be detrimentally affected by the proposed extension of the gas-works. The gentlemen who composed the deputation were sufficient evidence that the opposition which might be offered by them was based upon a solid foundation; and that they had a right to protest was shown by the fact that they contributed handsomely to the rates. The necessity for larger gas-works was admitted, and by none more freely than by members of the deputation. They suggested, however, that the interests of large ratepayers should be considered, and an adequate guarantee given in the Bill that no injury would be done to any of the city's industries. The various discussions which had taken place on the subject from time to time had had the effect of somewhat confusing the subject, not only to the members of the Council, but also to the ratepayers, including the deputation. Had they fully apprehended what was actually intended to be done and the powers which were sought in the Bill, they would have taken steps earlier to lodge an emphatic protest, and have their views properly presented to the Corporation. But no opportunity was afforded them of fully understanding the provisions of the Bill until it appeared in print, which was only three days prior to the meeting at which the Corporation passed the resolution last month. After the Bill had been printed and notices inserted in the local papers, many ratepayers found that their interests was threatened. In common justice, they should be afforded an opportunity of discussing the matter with the Council and the Gas Committee, when not only their views could be expressed, but they could reply to the arguments of those who were in favour of the proposed extension. As large ratepayers, having the interests of the city at heart, they desired that this course should be adopted; otherwise they would be compelled to oppose the Bill at every stage—thus involving serious expenditure of time and money, not only by private individuals, but also by the Corporation.

Mr. T. M'BRIDE also addressed the Council, and said the firm he represented were very much afraid that their business would be injured by the fumes from the gas-works if the proposed extension were carried out. They also objected to the extension contemplated being in such close proximity to their warehouse, as they thought gas-works would cause deterioration of their property, in the building of which they had expended large sums of money, and consequently result in serious loss to them. Therefore they strongly opposed the proposed extension.

The LORD MAYOR said the matter would be considered by the Corporation, and he had no doubt it would receive every attention.

Mr. INGLIS briefly thanked the Lord Mayor and members of the Council for having received the deputation, who then withdrew.

Alderman CRAIG thereupon moved the confirmation of a resolution sanctioning the promotion of the Bill, the objects of which were fully specified.

Mr. SQUIRE, in seconding the motion, said that while he was sure the Corporation would give consideration to what had been said by the deputation, he thought he was expressing the opinions of those with whom he had acted in connection with this matter in the past in stating that they believed the members of the deputation were very much too late in putting their views forward. Those who took an active part in the opposition to the extension of the gas-works on the present site had made up their minds to endeavour to make as great a success as possible of the decision at which the Corporation had arrived twelve months ago.

Mr. DONNELLY said he would venture to express the opinion that much money might be saved, not only to the Corporation but also to private individuals, if the members of the deputation could be satisfied now that their interests would be safeguarded. He believed the difficulty would be solved if an honourable arrangement could be arrived at that the ground in question would not be used for manufacturing gas, but only for storage purposes.

Alderman FINNIGAN said he heartily supported what Mr. Donnelly had said. It appeared to him that the matter could be easily settled in a few seconds if the Chairman of the Gas Committee would state that it was their intention to use the ground only for storage; and if the Town Solicitor were instructed to modify the clause to this effect, there would be no more trouble.

Alderman Sir JAMES HENDERSON said the steps that were absolutely necessary in order to have the matter brought before the Corporation had been taken; and it was only fitting that, as the present meeting was the first in the new year, they should confirm the resolution which had been passed. After what had been said by the Lord Mayor, it was clear that any differences that might exist could be amicably arranged before the Law Committee or some other. After all, it was a question not merely for the gentlemen who had attended on the deputation, but for the entire Corporation, who represented the citizens and ratepayers; and, in his opinion, every effort should be made to encourage the Gas Committee to enlarge the works without spending an enormous amount of money for another site. He understood from

Alderman Craig that the Committee were unanimous on this matter, and the members had attended most regularly while the subject was being discussed. Under these circumstances, he thought they should have no hesitation in confirming the resolution.

Mr. M'Mullan moved, as an amendment, that the debate should be adjourned for a fortnight, in order that the gentlemen who had appeared before them might place their views before the Committee.

Mr. Gregg seconded the amendment, and remarked that he thought they would probably get all they wanted by a friendly conference.

The amendment was rejected, and the motion was then put to the meeting and adopted.

Alderman Craig then moved that the Bill be approved; and the motion was carried.

The statutory meeting of ratepayers was held in the Council Chamber of the City Hall last Thursday, under the presidency of the Lord Mayor There was a large and representative attendance on the occasion. The Town Clerk explained the object of the meeting, and read a long resolution sanctioning the promotion of the Bill, and the payment of the costs and expenses out of the gas fund. The Lord Mayor moved the resolution, and it was carried by 293 votes to 186—a majority of 107. A requisition, signed by a number of important manufacturers and ratepayers, demanding a poll, was thereupon formally handed to the Town Clerk, who stated that the papers would be issued from the 16th to the 18th inst. The proceedings then terminated. It is stated that upwards of 70,000 papers will have to be delivered; and the cost of the poll will be about £300.

BIRMINGHAM CORPORATION GAS UNDERTAKING.

Proposed Reductions in Price.

It was intimated in the "Journal" last week that there was in contemplation a reduction in the price of gas in Birmingham; and particulars of its nature are given in the report which will be presented by the Gas Committee at the meeting of the Council to-day. The recommendation of the Committee is the outcome of a careful consideration of the finances of the Gas Department and the favourable outlook for the ensuing year. The following are the reductions proposed to be made in the charges for gas used for lighting and domestic purposes in one premises: Under 50,000 cubic feet per quarter, from 2s. 2d. to 1s. 11d. per 1000 cubic feet; 50,000 to 250,000 cubic feet, from 1s. 11d. to 1s. 9d.; 250,000 to 1,000,000 cubic feet, from 1s. 9d. to 1s. 7d.; 1,000,000 to 2,000,000 cubic feet, from 1s. 8d. to 1s. 6d. For each additional million cubic feet or portion thereof there will be a reduction on the total consumption of 1d. per 1000 cubic feet, until a minimum rate of 1s. 2d. per 1000 cubic feet is reached. For manufacturing and power purposes, the price will be reduced from 1s. 6d. to 1s. 4d. per 1000 cubic feet where the consumption is less than a million, and from 1s. 5d. to 1s.3d. where it ranges from this figure up to 2 millions. For each additional million cubic feet or portion thereof there will be a reduction of 1d. per 1000 cubic feet on the total consumption until a minimum of 1s. per 1000 cubic feet is reached. These prices are to be subject to 5 per cent. discount for prompt payment. Slot-meter supplies are to be as follows: With gas fittings and cookers free, the quantity of gas supplied for 1d. is to be 35 instead of 31 cubic feet; and with cookers only free, 39 instead of 35 cubic feet.

Progress in the Past Year.

Under the heading of "A Year of Record Achievements," the following remarks on the progress of the gas undertaking in the past twelve months appeared in the "Birmingham Daily Mail" last Thursday.

The past year must be regarded as a record in the history of the gas undertaking. The consumption showed a substantial increase, the surplus profit handed to the rates an advance of £3000, while the prices to the ordinary consumer were subjected to the reduction of 2d. (from 2s. 4d. to 2s. 2d. per 1000 cubic feet) in June last, and now from 2s. 2d. to 1s. 11d. The reduction in June represented to the consumers concessions to the amount of between £30,000 and £40,000; so that the more recent reduction represents even larger figures. It will be seen from the table below that the new charges afford favourable comparison with the prices which obtain elsewhere. The figures relating to other big centres are taken from the latest available returns, and furnish an interesting comparison:—

	Per 1000 Cubic Feet. s. d.	
Birmingham	1 11	less 5 per cent.
*Bristol	2 0	
Edinburgh	2 8	
Glasgow	1 11	
*London (four undertakings)	2/2, 2/4 2/7, 2/5	
Leeds	2 2	less discount.
Leicester	2 4	
Manchester	2 3	
*Newcastle-on-Tyne	1 11½	
*Nottingham	2 4	
*Sheffield	1 3	
*Widnes	1 1	

* In these cases meter-rents are charged.

The charges in the bulk of the Midland towns are much higher than those quoted

It should be stated that the low price which obtains at Sheffield is due mainly to the fact that that city is situated in a coalfield which furnishes a gas-producing coal; and the same observation applies to Widnes. Birmingham does not enjoy this advantage, though it lies practically in the centre of the Midland coalfield. Local coal is not so suitable for gas making as that from the seams of Derbyshire, Nottinghamshire, and South Yorkshire, from which Birmingham obtains the bulk of its supplies. So far as freightage is concerned, Birmingham pays for its coal something like 3s. per ton more than Sheffield. London is in a rather worse position in this respect than Birmingham, in that nearly all the coal required by the Metropolis is seaborne from the Northern coalfield.

The consumer of gas by the prepayment meter system has also benefited materially; the concession being equal to 4 cubic feet of gas per penny. This applies to the consumer who uses both the gas fittings and cooker of the department. The increased quantity is equal roughly to 13 per cent. The Gas Committee maintain that the customers on the prepayment meter system are now being treated on exceedingly fair, if not generous, terms. The Department incurred a heavy capital outlay in the provision of fittings for this class of business, and for a long time it was unremunerative.

The progress and development of the city gas undertaking has been consistent. For the first time in its history, the turnover amounts to upwards of a million pounds, while the sinking fund exceeds this figure. Since 1884 (when Mr. Maurice Pollock was Chairman of the Gas Committee) the quantity of gas sold has more than doubled—increasing from 3000 million cubic feet to more than 7000 millions. The retail price to the ordinary consumer has been several times reduced, till it now stands at 1s. 11d. per 1000 cubic feet; while the cash contributed to the improvement rate has been increased from £25,000 to £75,000.

The following table shows at a glance the phenomenal growth of the Gas Department:—

Year.	Coal Carbonized. Tons.	Gas Sold and Used on Works. Millions.	Average Net Price of Gas. s. d.	Surplus Profit. £
1875	296,000	2327	About 3 1·25	25,339
1880	307,232	2675	2 7·35	57,009
1884	323,050	2953	2 2·65	28,465
1885	343,156	3151	2 1·29	25,000
1895-6	480,427	4334	2 2·40	25,000
1905-6	536,470	6565	2 0·99	54,546
1906-7	562,486	6730	2 0·50	57,563
1907-8	587,490	7042	2 0·55	61,313
1908-9	571,975	6977	2 0·03	71,459
1909-10	568,733	7205	1 11·41	72,492
1910-11	593,724	7693	1 11·18	75,621

In addition to the £75,000 paid in relief of the rates, the Department has contributed annually about £20,000 in the way of interest on the reserve fund and contributions in aid of public llghting,

It may be added that last year the coal was more completely carbonized than in any previous year, chiefly as the result of chemical research work. A laboratory, established some years ago, has been most successful in its operations; and there is little doubt that its work has contributed materially to the good results. The cost of coal increased only about £5000; but the income of the Department from gas sold advanced upwards of £40,000, while the value of the residual products increased £34,000. To the better results in carbonizing these additional benefits are largely due.

MANCHESTER CORPORATION GAS-WORKS.

A Progress Report.

We have received from the Superintendent of the City of Manchester Gas Department (Mr. F. A. Price) the following particulars with reference to the progress of the business. The information bears the signature of Mr. H. J. Brocklebank (Statistician).

The consumption of gas has continued to increase, despite the general use of the incandescent system of lighting and competition of electricity. It is singular that the former method of lighting has been a more important factor to contend with than even the competition of electricity. When using the incandescent burner, a saving of 20 per cent. of gas is effected by consumers, who, at the same time, obtain three times as much light as they formerly got from the flat-flame burner.

The supply of free cookers and other gas appliances has helped to maintain the normal growth of consumption. The stimulus given to the output of the gas undertaking by these means is reflected in the following figures:—

		Per Cent.
Average increase	6 a.m. to 2 p.m.	38·2
,,	2 p.m. to 10 p.m.	8·6
,,	10 p.m. to 6 a.m.	8·7

Records of the hourly consumption show a percentage increase varying from 20 per cent. from 6 to 7 a.m. to 56 per cent. for the hour 12 to 1 p.m. The largely superior increase in the "day-load" over that of the remaining hours of the twenty-four exhibits in a striking form the huge advantage of the "free stoves" policy. There is a considerable inquiry respecting high-pressure gas lighting; and an extension of high-pressure mains is being made to meet the demand. The number of consumers shows the normal increase during the ensuing financial year; and the demand for cookers continues at the average of past years.

As a provision for the extended business of the department, the producing capacity of the works now stands at 27 million cubic feet per 24 hours; and the storage capacity, with the new holder, now nearly completed will be about 35 million cubic feet. The sanction of the City Council to a scheme for promoting the use of gas-fires on terms most favourable to the consumer has resulted in a great demand for this cleanly, convenient, economical, and reliable system of heating. If the above system of heating was generally adopted by the occupiers of offices within the city, the atmosphere would be freed from much deleterious matter.

The gas-works are in the highest state of efficiency; and it is confidently expected that the policy of the Gas Committee already put into operation, and other changes foreshadowed, will prove a new and effective stimulus to the gas industry, and will induce a steady, additional, and increasing demand. A corresponding reduction in the cost of manufacture, distribution, and administration will naturally follow.

The Shoebury Urban District Council have sanctioned a rebate of 4d. per 1000 cubic feet to consumers of 30,000 cubic feet of gas per annum, and 6d. to those using 50,000 cubic feet.

THE LIMITATION OF MUNICIPAL GAS PROFITS.

Salford Corporation and Outside Authorities to Fight the Matter Out—Local Government Board and the Dispute.

From the correspondence read at a meeting of the Salford Town Council last Wednesday, it appears that the efforts made by the Corporation to bring about a settlement on the question of the limitation of the gas profits with the outside authorities within the Corporation gas supply area have failed, and that, to use the phrase of a member of the former authority, it is likely to be "a fight to the finish" on the point raised.

It was announced by the Town Clerk (Mr. L. C. Evans) that the Corporation had been successful in the application made to the Local Government Board for a Provisional Order in regard to the gas undertaking. The communication from the Department contained the following:

> The Board have decided to entertain the application, and they will shortly direct a local inquiry by one of their Inspectors. . . . In connection with the application, the Board have had under their consideration the two Bills of which notice has been given for the next session of Parliament by the Corporation and by the Eccles Town Council and the Swinton and Pendlebury and Worsley Urban District Councils. If these Bills were proceeded with, a costly contest in Parliament would seem to be inevitable; and having regard to the provisions of section 10 of the Borough Funds Act, 1872, and to the fact that the objects aimed at are attainable by Provisional Order, the Board would feel considerable difficulty in sanctioning the promotion of either Bill under the Act mentioned. The local inquiry into the application made to the Board by the Corporation will afford a convenient opportunity for the consideration of the questions at issue between the Corporation and the local authorities of the areas outside the borough which are supplied with gas by them. The Board hope that the authorities may be able to arrive at some arrangement which will be satisfactory to both sides, effect to which can be given by the proposed Order.

The Town Clerk next submitted the correspondence which had passed between the Corporation and the Town Clerk of Eccles, acting for the three outside authorities promoting the Bill. On Dec. 12, the Town Clerk of Salford wrote pointing out that the Sub-Committee selected by his Council to deal with the matter desired, if possible, to come to some amicable agreement in regard to the differences existing. As the main question related to the limitation of the profits of the gas undertaking, the members of the Sub-Committee suggested that a conference should be held to consider and arrange, if possible, a settlement on the principle of a division of profits whereby the ratepayers of the districts outside the borough, supplied by Salford, might participate. In reply to this, the Town Clerk of Eccles wrote:

> Although the three authorities fully agree that, in ordinary circumstances, negotiations with a view to settling differences between local authorities are always desirable, and though they greatly regret the expenditure of public money which is involved in the promotion of two Bills in Parliament, yet they consider that in the present case they would not be justified in negotiating with your Corporation upon the lines indicated in your letter. The proposal you make appears to the three authorities to be one which is not only entirely subversive of the principle for which they contended when the Salford Gas Bill was before the House of Lords in 1909, but is contrary to the policy of Parliament as laid down in that case and in the subsequent case of Glasgow. At the same time, the three authorities are, and have always been, ready to consider any proposal which your Corporation might wish to put forward with a view to carrying out the broad principles laid down by, or involved in, the decision of Lord Donoughmore's Committee in 1909. The three authorities cannot accept your suggestion that they should abandon the promotion of the Bill which they have deposited, and that the matter should be referred to the Local Government Board for decision. A specific decision of a Select Committee of the House of Lords is involved in the question; and Parliament is the proper tribunal to deal with the matter.

There was no discussion on the correspondence.

It is stated (unofficially) that the Local Government Board intend to oppose the Bill which has been lodged by the Eccles Corporation and the Urban District Councils of Worsley and Swinton and Pendlebury with a view to compelling the Salford Corporation to give effect to the decision of Lord Donoughmore's Committee as to the limitation of gas profits.

NEWCASTLE-UNDER-LYME GAS UNDERTAKING.

Local Government Board Inquiry.

At the Town Hall, Newcastle-under-Lyme, last Tuesday, Mr. H. R. Hooper, M.Inst.C.E., held an inquiry relative to an application made by the Corporation to the Local Government Board for authority to partially repeal, alter, or amend the Corporation Act of 1877, with the object of conferring additional borrowing powers.

The Town Clerk (Mr. Joseph Griffith) first explained the financial position of the borough. He said that in December, 1910, Major Stewart held an inquiry when a statement was put in showing how the accounts of the Corporation stood at the bank. From this statement, it appeared that several of them were overdrawn. The only one, however, which was overdrawn to a serious extent was the gas account, which at the time was overdrawn to the extent of £6576. It had been overdrawn to a similar extent for a number of years. In 1896, it was overdrawn to the extent of £6807; and it appeared, subject to slight fluctuations, practically to have remained stationary at this figure ever since. The overdraft arose, in the first instance, because no additional capital had been raised for a good number of years. The last sanction obtained from the Local Government Board was dated Aug. 24, 1896, and was for £3558. This amount exhausted the borrowing powers of the Corporation under the Provisional Order issued in 1891. Since 1896, additional capital expenditure had been incurred to the extent of £15,008; and this had partly been paid out of profits and partly by overdraft at the bank. The total amount of capital expended on the works was £106,801; and stock to the extent of only £93,341 had been issued. This left a balance of £13,460 raised otherwise than by the issue of stock, £9609 of which had been paid for out of profits, and the balance of £3850 by means of an overdraft at the bank. In the last ten years, profit to the extent of £19,311 had been made on the gas undertaking; and of this amount £16,700 had been paid to the relief of the rates, £719 used to clear off the overdraft at the electric light works, while the balance had been unappropriated profits, which now amounted to £9609. The Local Government Board insisted upon the bank overdraft being wiped out; and the Corporation made proposals for its extinction. The Board stated that it ought to be cleared off within three years. A deputation waited upon the Board, and as a result it was decided to apply for further borrowing powers to enable the Corporation to raise working capital when required for future extensions. In the application, no definite amounts had been stated, so that the Board might fix them. The grounds upon which the application was based for a sum for working capital were these: (1) £106,801 had, as already mentioned, been spent upon capital account, and stock to the extent of only £93,341 had been raised. This left a balance of £13,460, which had been invested in the works by the Corporation. (2) The average amount of stock in hand and debts due from consumers was £5759; while the debts owing by the gas concern for interest and creditors was only £1732, which left a balance of revenue assets of £4027. If the capital expenditure for which no loan had been sanctioned (£13,460) and the balance of the revenue (£4027) were added together, it showed a surplus of £17,487 in favour of the Corporation. This, it was thought, justified them in applying for working capital; and a sum of £5000 or £6000 had been suggested for the purpose. As regarded borrowing powers for additional capital expenditure, this amounted to £3000. During the past few years, £1900 had been paid annually to the relief of the rates. This year's estimates were based on the assumption that £1500 would be received from this source; and the Chairman of the Finance Committee wished this arrangement to stand, as otherwise the finances of the town would be much dislocated. It was proposed that next year the contribution should be £500, and in the following year and consecutive years be reduced to a nominal sum of £250. The contribution would then remain at £250 until the overdraft had ceased to exist, and a balance had been obtained at the bank. If the Board would sanction a sum of £5000 or £6000 for working capital, and the raising of additional capital for future expenditure, it was hoped that the overdraft would be wiped out within a period of three years.

A number of detailed questions by the Inspector were answered by the Town Clerk and the Accountant-Auditor (Mr. J. C. Bladen). In the course of them, the Town Clerk admitted that a sum of £4000, borrowed in 1892 under the representation that it was for working expenses was, so far as could be ascertained, used for capital purposes; so that originally they had no working capital—they simply paid for the undertaking.

The Inspector remarked that the position of the Corporation was just as bad now as it was in 1892, except that the bank overdraft was worse. If they had not devoted all the gas profits to the reduction of the rates, there would have been no necessity to borrow to wipe off the overdrafts. Dealing with the profit and loss account as printed, he pointed out that there was no such thing as a profit and loss account, because there were no funds. The Corporation had actually drawn £508 in cash from this account and had credited it to the ratepayers; and yet there was not a halfpenny in the account to draw. It was a loss account—not a profit account. How could they take £500 from a fund which had not a penny in it? Was it not a direct misrepresentation to the ratepayers?

The Town Clerk said it was not, because the Corporation had made a profit annually.

The Inspector: Yes; but you have spent it on capital account. You have not got it now. The Committee knew that there was not a penny in the fund, and that they were drawing merely from paper. The ratepayers had to pay interest on money they had never had.

In reply to further questions by the Inspector, the Town Clerk said there was no reserve or depreciation fund; only a sinking fund.

The Inspector: Is there any gas undertaking in the country which can be considered financially sound without a penny in the reserve or depreciation fund?

Mr. Hassam (the Chairman of the Finance Committee): And I cannot tell you any which has a sinking fund such as we have. He added that they were maintaining the works in first-class condition.

The Inspector replied that he had not found gas-works of forty years' existence which were considered up-to-date. There had been great savings effected lately through modern apparatus. He suggested that it would have been better if the Council had created a reserve or a depreciation fund instead of taking the profits for the reduction of the rates.

Mr. Hassam said there was a varied feeling in the Council on the matter now. The practice was adopted all over the country; but their feeling was that it should be stopped.

The Inspector said it ought never to have gone on. He further remarked that when they got into overdrafts, they lost control. It was certainly hard on the ratepayers, because they would have to pay interest on the money. These things were not looked at sufficiently hardly in the face. The profits which they had allocated to the relief of the rates they had now to come to the Local Government Board to borrow.

Mr. Hassam said they were merely continuing the policy of their predecessors.

The Inspector; Yes; following a policy of drawing from a fund

when you had no money. What one might really describe as a most excellent policy!

Mr. HASSAM: We do not agree with it, and never have defended it.

The INSPECTOR further remarked that here was a business undertaking which had been running for 35 years, and they had now to come and borrow working capital.

The TOWN CLERK remarked that it was the result of the suggestion of the Local Government Board.

The INSPECTOR: Because you had been working on an overdraft. It was the only thing to do. He added that, after all, there was no profit. Profit was not merely £ *s. d.*; it was to keep their works up-to-date, and in a model condition, so that they could compete with all gas-works in the country.

Mr. HASSAM said this was the opinion which some members of the Council had held for years.

There was no opposition to the application.

STOCKPORT GAS COMMITTEE AND LOCAL PLUMBERS.

Objections to the Fixing of Gas Appliances by the Corporation.

Correspondence which has passed between the Stockport Master Plumbers' Association and the Gas Committee of the Corporation relating to the fixing of gas appliances was included in the minutes of the Gas Committee submitted for confirmation at last Wednesday's meeting of the Town Council. Summarized, the proposals of the Master Plumbers' Association were that all gas cooking and heating appliances let out on hire and fixed at the expense of the Corporation should be fixed by master plumbers at the scale of charges, and on the conditions, which had been adopted by the City of Manchester; and that "the Gas Committee shall not sell gas appliances in unfair competition with the legitimate business of local plumbers and ironmongers and others who are shopkeepers and ratepayers in the district." At the December meeting of the Committee, the Gas Engineer (Mr. S. Meunier) submitted a tabulated statement of information on the question received from other towns; and it was decided that the Master Plumbers' Association should be informed that the Committee could not agree to adopt the Manchester scale of allowances to plumbers for fixing the gas appliances let on hire and fixed at the expense of the Corporation, also that the Committee had not sold gas appliances in unfair competition with the local plumbers and ironmongers. The Committee further decided to adhere to the terms of a letter sent to the Master Plumbers' Association by Mr. Meunier in 1906, which contained the following paragraphs:

(1) *The Gas Committee Stop at the Meter.*—When your representatives met the Sub-Committee, they were assured that it was not the intention of the Committee in the future, any more than in the past, to undertake the work from the outlet of the meter. That had only been done on very rare occasions, and by special desire, and it has always been, as far as possible, discountenanced. This procedure was not intended to be departed from.

(2) *Sale of Incandescent Mantles and Fittings.*—The Committee do not feel that they can possibly give an undertaking not to sell a special fitting or a type of mantle or incandescent burner which is most suitable for the quality of gas manufactured to an ordinary consumer who goes to the shop. At the same time, I am to assure you that they do not intend in any way to sell any quantities or to supply generally, but only in the case of odd burners or mantles, together with, of course, any very special fittings which may have been put up for show. Ordinary gas-fittings, &c., will not be dealt with at all.

In the discussion which followed the reading of the minutes,

Alderman ALLCOCK said the plumbers complained that the Gas Committee took upon themselves to fix, free of cost, gas-fires let out on the hire-purchase system. This, he argued, was wrong, and unfair to the tradesmen of the town. He was convinced it was not right for the Gas Committee to go beyond the fixing of meters; and he moved, as an amendment, that the matter be referred back to the Committee for further consideration. He pointed out that at Southport and Nottingham the plumbers were allowed a certain amount of money for fixing the stoves in different districts; and he had no doubt that if a scheme of this sort had been brought forward by the Gas Committee, it would have received support.

Mr. NODEN, who opposed the amendment, said he was in the Council to support a policy of municipal trading, and he had done it in the Gas Committee in the best interests of the ratepayers, and not of the plumbers. If the plumbers had lost any volume of trade through the action of the Committee, they might be able to make out a case. But the fact was they had lost nothing; facts and figures were against them. The Corporation had themselves not only developed this branch of trade, but had actually made it. It was not in existence when the Gas Committee took the matter in hand. The local plumbers would like the Committee to give them the Manchester scale, which worked out at about £1, whereas the work could be done for 10s.

Mr. NIXON agreed that the plumbers had become alarmed; and so, he said, would any member of the Council be, if he thought the Gas Committee, or any other, were trespassing on his business. His (the speaker's) point was, if the Gas Committee knew a reasonable price for fixing appliances, why did they not come to equitable terms with the master plumbers?

Alderman SHARPLES remarked that the last speaker had ignored the line of argument taken up by Mr. Noden—viz., that the trade never was the business of the plumbers. The plumbers had not created it, nor had they any material or commodity to continue it. He was quite certain that if the Gas Committee gave up fixing gas-stoves and other appliances, their progress and expansion would come to an end. No sound argument had been advanced now for the surrendering of this department to the plumbers and ironmongers of the town.

The discussion having been continued by several other members of the Council,

Alderman FERNLEY, Chairman of the Gas Committee, emphasized the point made that the fitting business had been built up by the Gas Department. They had always cultivated it, and had obtained very large stocks for the people to view and select from. It should not be forgotten that they gave the plumbers the opportunity of going down to the gas-works and purchasing gas-stoves for customers at a very liberal discount. If the Committee conceded the demands of the master plumbers, and allowed the Manchester rate for fixing the stoves, it would mean that they would have to pay double what it was now costing them. In reply to a question, the speaker added that the stoves were fixed by gas-fitters, who were paid the standard rate of wages.

The amendment was defeated by 36 votes to 9; and the minutes were then confirmed.

TESTING ELECTRICITY METERS IN MANCHESTER.

At the Annual Meeting of the Manchester City Justices last Friday, the Gas Testing Committee reported that they had had under consideration the question of the desirability of an independent test being applied to electricity meters within the city; "the necessity for an independent testing authority being generally admitted." The Committee's report proceeded: "In Manchester, the testing of electricity meters is at present in the hands of the Corporation, who are the makers and vendors of the electric current. In the absence of legislation, the transfer of the testing to an independent authority can only be done with the consent of the Corporation. Correspondence has passed between a Committee of the Justices and the Electricity Committee, but the latter Committee had not up to this date arranged a day upon which the two Sub-Committees could meet."

The Chairman of the Electricity Committee (Mr. G. Howarth) took exception to the reference in the report to the question of testing electricity-meters, and moved that the report be sent back for further consideration, on the ground that the matter was receiving the serious attention of the Electricity Committee.

The Lord Mayor (Mr. S. W. Royse), who presided, spoke in defence of the Electricity Committee. He said their Chief Engineer was instructed last July to make full inquiries as to the possibilities of having the electricity-meters tested at a reasonable cost, and to ascertain what was the practice in other towns. After exhaustive labours, he presented a report in September last; but it had to be referred to a Sub-Committee, and this caused delay. In his opinion, the Magistrates would not be justified in issuing a report which suggested that the Manchester Corporation wished to do something wrong in regard to the testing of their electricity-meters. The Corporation were desirous that the meters should be exact; but it must be remembered that the testing of them was not so simple a matter as that of testing gas-meters.

After more discussion, the proposition that the report be referred back was carried by 36 votes to 21.

SEQUEL TO A MOTOR-CAR ACCIDENT.

There was a protracted discussion at the monthly meeting of the Oxford City Council, on a report from the Parliamentary Committee, which was submitted by the General Purposes Committee. This was to the effect that the Committee had had under consideration a claim made by Dr. Moffatt, of Blackburn, for damages to himself, his sister, and his motor-car, caused by a collision on Oct. 4 of the car with a lamp-post standing in the centre of Catherine Street—it being dark at the time, and the lamp unlighted. After full consideration of the case, the Chairman of the Gas Company (Alderman Ansell) and the City Solicitor proceeded to Blackburn, and settled the claim for a sum of £410 and costs. The Committee recommended that of this amount the sum of £200 be repaid to the Gas Gompany in full settlement and discharge of all liability on the part of the Corporation in respect of the claim.

When the report came up, an amendment was moved by Mr. Gray, that the proposal to pay £200 to the Gas Company be deleted. He thought the expedition to Blackburn had rather prejudiced the position of the Corporation, and complained that, as members of the Council, they had no knowledge of the details of the accident. The Gas Company were responsible to the Corporation under the contract for seeing that the lamps were lit during prescribed hours. He hoped a majority of the members would vote against the report, because it seemed to him that what had been done had been done in a panic, and it might lead to many other such claims being made in the future. Mr. Collcutt (who seconded the amendment) said that under the contract with the Company the lamp in question should have been lighted by 6.39. As far as they had been told, the accident occurred at 7.30; and the lamp was not alight then. The Town Clerk: It had been alight. Mr. Collcutt (continuing) remarked that it was surely quite clear that the accident was caused by the lamp being unlighted. The Gas Company were responsible for this; and it seemed to him the Committee were exceeding their duty to the Council in the matter. The Corporation should have held aloof, and allowed the Company to settle the business in any way they thought fit. After the settlement of Dr. Moffatt's claim, the Parliamentary Committee proceeded to do what they ought to have done before—namely, consider how far the Corporation were liable. And when this point arose, he could not help thinking it was extremely unfortunate for the Committee that three of the members should be Directors of the Gas Company. They had been told that these three Directors walked out of the room while the question of their liability was being discussed; but no doubt there was a certain moral influence at work. Mr. Hastings agreed that the Gas Company were liable, as they had failed to keep their contract; and he supported the amendment, as did likewise Mr. Embling and Mr. Higgins. Mr. Embling asked who had given directions for the lamp to be moved; and the Town Clerk replied that it had been done by the City Engineer. Mr. Higgins inquired whether the lamp was not out owing to the controller getting out of order; and he expressed the opinion that, under all the circumstances, it had been clearly shown that this was the sole liability of the Gas Company. Mr. Hastings asked if there was any provision in the contract making the Company liable for any damage arising from the lights going out. He could

not find any; and it was a most extraordinary agreement. Alderman Twining, as a member of the Parliamentary Committee, maintained that they had done the very best they could in the interest of the city. It was, he pointed out, not only a question of the light being out, but of liability for the lamp being placed in the position it was without any guard whatever. He was sure if the matter had gone on, they would have been involved in serious costs in litigation. Mr. Smart protested against the removal of the lamp while the question was *sub judice*. It seemed to him that it was making a complete confession of their liability, and that it was a most unwise thing to have done. The Mayor (Alderman Kingerlee), in the absence of the Chairman and Vice-Chairman of the Parliamentary Committee, then called upon the Town Clerk to answer the various questions that had been raised.

The Town Clerk began by reminding the members of a letter he had read on Oct. 23, in which a claim was made for £450 to be paid within a week from Oct. 11. This, he said, was printed in full in the Council minutes. The Council referred the letter to the proper Committee—the Parliamentary Committee. Someone had said it was unfortunate there should be on this Committee three Directors of the Gas Company. His only answer to this was that they could not eliminate from the Corporation, and from all the Committees of the Council, every member who had any interest in anything at all in the city of Oxford. The Committee, as the result of information placed before them, had allowed the Chairman of the Gas Company and the City Solicitor to proceed to Blackburn to endeavour to settle the matter, in order to avoid legal proceedings. A sum of £410 was paid, as he understood, by the Gas Company's cheque. Up to this point, there was no recognition, beyond the presence of the City Solicitor, of any obligation on the part of the Corporation; but the action, if the matter had not been settled, would have lain against the Corporation, who were responsible for placing the lamp-post where it was. When the claim was done with, the Committee met again to consider the position. They received a claim from the Gas Company for a sum of at least £200; and they had to consider what was the obligation of the Corporation in regard to the matter. The lamp-post had been there for 22 years or more; and really this was the weakest point in the case for the Corporation. When it was fixed, the street where the lamp stood was a very narrow thoroughfare; but it had since been considerably widened, and if the lamp-post was in its proper place 22 years ago it was not in its proper place on Oct. 4 last. The lamp-post was standing in the centre of what had been a narrow road, but which had been latterly widened; and if the highway authority of the city placed anywhere in the centre of the highway, or in any part of it, an obstruction, they must so mark it that the wayfaring man, ignorant as he might be, could not run into it. This was the proposition he had laid down to the Parliamentary Committee. The expenses of the City Solicitor were paid by the Gas Company, who would bear the costs incurred in the matter of the settlement. The Highways Committee had directed the City Engineer to move the lamp, but not until the whole affair had been settled by the Council. By some mistake the latter part of the direction was not observed, and the Corporation officials removed the lamp and placed two others on either side of the street. He agreed with Mr. Smart that it was regrettable that the lamp was moved before the matter was completely cleared up. He ventured to think if they passed this recommendation they would be taking the safest and sanest course on behalf of the citizens. The contract with the Gas Company provided for the lighting of lamps at a particular time; and there was conclusive evidence that this lamp was alight at 7 o'clock on the evening in question, though it was out at 7.30. There were penalties for the non-consumption of gas through lamps not being alight; but they did not, of course, cover cases like this.

Further discussion ensued, in the course of which Alderman Sir R. Buckell pointed out that it was the city's lamp and standard which were involved; and on a division, the recommendation of the Committee was agreed to by 22 votes to 11.

COKE AS A DOMESTIC FUEL.

The Engineering Supplement of "The Times" last Wednesday contained the following letter, by Mr. Kenneth R. Swan, on the use of coke as a domestic fuel.

I think that the widest possible publicity should be given to the observations made by Professor Vivian B. Lewes, in his last Cantor lecture delivered before the Society of Arts. [See "JOURNAL" for Dec. 26.] Professor Lewes points out that "if the gas companies would only live-up to their titles of 'gaslight' and 'coke' companies, and bestow as much care on the coke as on the gas, and cater for the supply of a good domestic fuel at the price of coal, instead of treating coke purely as a bye-product, the demand for it would soon reach a point that would enable the desired reductions in the price of gas to be made." This is a most pregnant observation, and one which the gas companies would, one and all, do well to brood over deeply.

I have for some considerable time been a consumer of coke for household purposes, greatly disliking to be a creator of pestilential smoke. I have tried several sources of supply, but have never yet succeeded in obtaining a reasonably good quality of material—a quality, that is, sufficiently good to commend coke to the general user as a domestic fuel in place of coal. The sole reason of this is the one which Professor Lewes points out—viz., that the gas companies persist in concentrating their attention exclusively on the production of gas, and utterly neglect the no less important consideration of the production of good coke suitable for domestic fuel.

It may be that an improvement in the quality of the coke could only be attained by the use of a better quality of coal for distillation, and doubtless also at some sacrifice of the quantity of gas extracted per ton of coal. But, from the enormously increased demand that a really first-rate quality of coke would certainly create, the gas companies would in a comparatively short time be reaping ample compensation for any diminution in their product of gas per ton of coal.

That there is a wide—almost unlimited—market for a superior quality of domestic coke is beyond question. Improvements in the construction of household grates, not to mention the educative advent of coalite, have opened the eyes of the public to the fact that coal is not the only, nor is it always the best, fuel for domestic purposes, and that there are many advantages attending the use of coke and coke-like fuel, if only a sufficient supply of uniformly good quality can be secured. The best material I have been able to procure has been deficient in two important respects—(1) in leaving an excessive residue of ash, choking the fire, and making an abominably dirty hearth; and (2) in having an excess of that most objectionable of impurities, sulphur. It is obvious that by a careful selection of coal, both these objections can be removed.

VALUE OF SULPHATE OF AMMONIA.

Lecture by Mr. W. Popplewell Bloxham, B.Sc., F.C.S.

A lecture was recently delivered before the West Kent Farmers' Club at Swanley, by Mr. W. Popplewell Bloxham, B.Sc., F.C.S., the Scientific Adviser to the Sulphate of Ammonia Committee, on the value of sulphate of ammonia as a fertilizer.

The lecturer said it was a matter of common knowledge that market gardeners in possession of deep fertile early soils in the vicinity of big cities and good markets relied on the use of very heavy dressings of farmyard manure. As much as 50 tons to the acre had been commonly employed, at a cost of 7s. or 8s. a ton. Though modern work had shown that great waste of valuable nitrogen followed upon such prodigal expenditure, immense crops were obtained, selling well on early markets. Most of the manure used was of the stable description; and during the last few years the supply had been decreasing, both in quality and quantity, at an alarming rate, owing to the replacing of the horse by mechanical traction with petrol as the motive power. As a consequence, market gardeners could no longer use so much stable manure; and farmyard manure could not replace it, owing to its cost—10s. to 12s. per ton, *plus* the expense of transport. Foreseeing these difficulties, the policy of the Sulphate of Ammonia Committee had been to diminish the quantity of farmyard and stable manure, to, say, 10 tons to the acre, and to supplement this dressing by one of artificials such as the following: 1½ cwt. per acre of sulphate of ammonia, in association with the necessary phosphoric acid (super or basic slag) and potash. Such a dressing cost, on an average, 30s. per acre, and using a mixture of farmyard (or stable) manure and artificials on a soil of fair fertility and sufficiently provided with lime—not less than 1 per cent. of carbonate of lime—the Sulphate of Ammonia Committee claimed that crops twice to thrice as great as the average could be obtained without letting down the fertility of the soil. As a concrete instance of this, a Lincolnshire potato grower, sceptical of the value of sulphate of ammonia, was induced to try it last season; and, in spite of the drought he obtained a crop of 13 tons to the acre, as against a fair estimate of 5 tons as the probable average crop for 1911.

For the purpose of establishing annual records of the growth of vegetables on the garden scale, the Committee had undertaken (jointly with the representatives of the potash and basic slag industries) the conduct of a fruit and vegetable farm in Hampshire, under the care of a well-known expert. Further, a new pamphlet had been issued showing the use of sulphate of ammonia in growing orchard, garden, and greenhouse crops. In addition, the Committee were willing to provide manures (lime, &c.) for sets of three one-tenth acre plots on farmers' or growers' land, and to provide the services of a supervisor, if required. In the latter case, the farmer or grower could select any crop on which he wished to try sulphate of ammonia.

Price of Gas at West Bromwich.—Mr. Bell, referring in the Town Council to the price of gas at West Bromwich, observed that at Birmingham a reduction in price to small consumers had been notified, bringing the charge down to 1s. 11d. per 1000 cubic feet, whereas the price in West Bromwich was 2s. 8d. The Mayor (Mr. J. A. Kenrick) pointed out that the conditions were different. The great output in Birmingham caused the cost of production to be proportionately much lower than at West Bromwich. The question of further economy was, however, receiving attention.

Wakefield Corporation and the Gas Company's Bill.—At the meeting of the Wakefield City Council last Tuesday, the General Purposes Committee referred to the Law and Parliamentary Sub-Committee the position with regard to the Wakefield gas undertaking and the Bill of the Gas Company, and empowered them to obtain evidence to assist them in the matter, and report to the Committee. Mr. Hill moved an amendment that the Corporation should engage an expert as to the expediency and the relative advantage of the Corporation acquiring the gas undertaking, or securing an amendment in the proposed Bill for the protection of the Corporation and the ratepayers. Such a question ought not, he contended, to be left to a small Sub-Committee; the whole Council should deal with it. Mr. Davies seconded the amendment; but on being put it was lost.

Lisburn Gas Undertaking.—At the last monthly meeting of the Lisburn Urban District Council, there was some criticism of the management of the gas undertaking, in consequence of complaints made by the consumers as to the quality of the gas. The Manager (Mr. J. Brodie) was absent on account of ill-health. Mr. Barbour said that some time ago the Council sought advice with reference to the improvements at the gas-works; and one of the best men in England—Mr. Newbigging—made a report. But the experts on the Council set up their opinion against his; and the public were paying the bill. Mr. Duncan said he believed they could not make good gas, and in sufficient quantity, with the existing plant. Moreover, there was a shortage of coal at the works. The Chairman (Mr. J. G. Ferguson) explained that formerly there was storage for 800 tons of coal; but the space had been utilized for new purifiers, so that at present there was not room for a large quantity. He presumed this was why the supply was allowed to run so low. Some of the members of the Council hinted that there was friction between the Manager and the men. Eventually it was resolved to call a special meeting to confer with Mr. Newbigging.

PUBLIC LIGHTING OF ASHFORD, MIDDLESEX.

We learn from the correspondent who has furnished the particulars which have appeared in the "JOURNAL" on the above subject that, in all probability the Voluntary Lighting Committee which has been formed at Ashford will soon be able to initiate a small scheme for lighting a portion of the parish. The circular recently issued to the ratepayers has brought in donations or promises to the extent of £20; while the voluntary rate of 1d. in the pound promised equals £120 per annum. This will enable the Committee to commence a scheme comprising about a dozen lamps; and negotiations are at present going on with the Staines and Egham Gas Company in regard to the matter. We understand that the Council have purchased thirteen lamp columns from a neighbouring corporation.

A resident, writing to a local paper, remarks: "The Coronation year of His Gracious Majesty King George the Fifth will be blessed by the present and future generations of Ashford who pass and gaze at the Commemoration lamp at the junction of the Ford Bridge and Church Roads. On the night of the 22nd of December—the first night of its being lit—many a voice was heard to exclaim: 'Lights for Ashford at last.' The Ashford Town Band gave a good selection of music.

The "Ashford Times," on Dec. 30, said: "The lamp given by the Coronation Committee from the balance at their disposal has been erected at the top of Ford Bridge Road, and was in use for the first time on Friday morning of last week. It has proved a 'Christmas Box' of the most acceptable type to the parish, and it is hoped that New Year's gifts of a similar character will be forthcoming. To the Council or to Mr. J. H. Tyons belongs the credit of pushing the matter on, and getting the lamp placed in position before Christmas."

Interest now centres in the forthcoming work "Trial by Jury," to take place in the Church Hall on Thursday, when, as mentioned in the "JOURNAL" last week, heavy damages will be claimed for injuries sustained by the plaintiff, owing to his falling into a ditch during the darkness."

When referring to the result of the poll on the public lighting question last week, our correspondent stated that, under the Lighting and Watching Act, no further action could be taken at the public expense for five years. It has been pointed out that the Act states that a year only must intervene before further movement can be made; and, on reference to the section bearing upon the matter, we find this to be so.

Windsor Castle Water Supply.—By direction of the King, the water supply at Windsor Castle is being thoroughly overhauled and a new service installed. The old water-wheel, which has done duty for upwards of a century at the Castle water-works near Romney Lock on the Thames, is to be demolished, and turbines are to be put in. The methods by which a water supply is maintained in case of fire at the Castle are also to be modernized.

LEEDS ELECTRICITY PROFITS

And Capital Charges.

During the holding of an inquiry at Leeds last Wednesday, with reference to an application by the Corporation for sanction to borrow £60,000 for purposes of electric lighting, Mr. H. R. HOOPER, the Local Government Board Inspector, made some pointed remarks upon the financial policy pursued by the Electricity Department.

Early in the proceedings, Mr. H. W. Totty, a ratepayer, said he understood the Corporation supplied electricity for power purposes to large firms at less than cost price; and he inquired whether this was the case. Mr. T. Thornton (the Deputy Town Clerk) denied that it was so, and said that the lowest price was ¾d. per unit. Mr. Totty retorted that his contention was that they could not produce the current at this price.

It was stated that the total amount already borrowed for electric lighting purposes was £1,059,768. Of the £60,000 which was now required, £40,000 was wanted for mains, £10,000 for sub-stations, and £10,000 for services. The Inspector thereupon commented upon the fact that the capital charges in Leeds were very high. In many places, he said, they were below 0·4d. per unit, whereas in Leeds they were 1d. The Corporation were making a profit of £10,000 a year, and they came to borrow money, in effect, to make contributions to the Leeds rates. The ratepayers would have to pay the capital charges. In finance, one must look at things in a hard, blunt way. The Leeds electricity undertaking had been making a surplus revenue, which apparently had been placed altogether to the relief of the rates. The effect of the present application would be to further increase the city's indebtedness, and to increase the rates. What advantage could it be either to the electricity undertaking or to the city? The Leeds Corporation were one of the few authorities who still purchased meters with borrowed money. Other authorities had seen that they saved money by purchasing them out of revenue. Capital charges had always handicapped municipal undertakings in this country. The necessity for borrowing now was to a very great extent to make contributions for the relief of the rates. Cheap power was the very life blood of a manufacturing city; and yet year after year this money had been applied in relief of the rates. There would be great difficulty in showing where the advantage of this policy came in. He suggested, for the most serious consideration of the Corporation, that they should from now stop borrowing money for meters. Mr. Thornton promised that this matter should be brought to the notice of the Committee.

The Inspector remarked that another point was that expenditure on services should be charged to revenue. His view was that the application for £10,000 under this head should be withdrawn, and that from now the meters should be purchased out of revenue. Mr. Thornton intimated that he could not comply with the suggestion that this part of the application should be withdrawn, as he was bound by the reso-

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is assured to every Gas Undertaking which finds new uses for the STEAMLESS RADIATOR.

To push the "Steamless" is to reduce your Radiator MAINTENANCE PROBLEM to vanishing point, because it is admitted on all hands that this apparatus—minus all complications—represents the ACME OF SIMPLICITY in Radiator Construction.

To let the "Steamless" ON HIRE to your Consumers is to please them and create at once a tremendous increase in gas output. On all hands you make for greater prosperity.

DAVIS

Gas Stove Co., Ltd., Luton.

lution of the City Council. The Inspector then proposed that this item should be left over until it had been further considered by the Council.

Interviewed by a representative of the "Yorkshire Observer" on the subject, Alderman F. Kinder (Chairman of the Finance Committee) pointed out that he could only speak with reserve on the topic, as he had not seen a full report of what the Local Government Board Inspector had said. The Corporation were entitled, by the Act of 1899, assuming they had earned the money, to take 5 per cent. on the aggregate capital to the relief of the rates, if they thought fit to do so. The aggregate capital of the Leeds electric light undertaking was £1,059,768; so that under the Act the Corporation were entitled, if they made the money, to take in relief of the rates over £50,000 a year. Yet the Inspector himself admitted that they had taken only £10,000. Then the Act said that any deficiency of income in any year, when not met out of the reserve fund, should be charged upon the rates. Thus, according to the Inspector, the Corporation were not to take advantage of the provision of the Act, which said that surplus profit should go in relief of the rates, but were left with the obligation that if there was a deficiency the general body of ratepayers must meet it.

"Brought to the bed-rock," said Alderman Kinder—"and I am not expressing my opinion as to the general principle, because this is neither the time nor the place to do so—the Inspector's proposition comes to this: (1) That present-day ratepayers are to be asked to pay more, or (2) that users of electricity are to be asked to pay more, in order that the ratepayers or the users of electricity of the future may pay less. Because it is obvious that, if the charges for services—that is, the coupling up of each individual user to the main or mains—are to become revenue charges, then the cost of electricity must be proportionately advanced to the user, or the ratepayer must make up the difference from the rates. In other words, assuming there is a surplus, the ratepayer will not get the relief in rates to which he is entitled, and to which I think he is justly entitled, having regard to the fact that in case of any deficiency he must make it good. This seems to me to be neither justice nor equity. But, in any event, it is purely a matter of policy, and one for decision by the Corporation, and is not, in my view, a proper subject of comment by a Local Government Board Inspector, whose sole province is to see that the application of the Corporation is within the law, and within the borrowing powers authorized by Parliament."

Concession to Prepayment Consumers at Batley.—Alderman Ward, the Chairman of the Gas Committee, reported to the Batley Town Council that it had been decided to allow an additional rebate of 1d. in the shilling in respect of supplies of gas through automatic meters. This would, he said, reduce the price of gas supplied in this way to 2s 9d. per 1000 cubic feet, as against 2s. 4d. charged for gas supplied through ordinary meters.

BIRMINGHAM WATER CHARGES.

At a Special Meeting of the Birmingham City Council to-day, the Water Committee will present a report stating that the exceptionally fine and hot summer, combined, as it was, with an active trade demand, naturally led to an increase in the consumption of water; the average daily distribution for the six months from Lady-day to Michaelmas (exclusive of the bulk supply to Coventry) having been 23·330 million gallons per day, against 20·776 millions during the corresponding half of 1910. The maximum day was July 13, when 30·581 million gallons were supplied; while the maximum week was that ended on July 27, with a total of 191·529 million gallons—giving a daily average of 27 361 million gallons. Both these maximum figures constitute records for any summer half year. The maximum normal delivery of the Welsh aqueduct, limited as it is to two pipes on the syphon sections, is 25 million gallons per day. The demand has in many weeks during the summer exceeded the full capacity of the aqueduct, even when there have been no interruptions. In the early part of the summer, these were, however, somewhat frequent, owing to bursts on the pipe sections, with the result that the old works had on several occasions to be utilized; and of the total quantity of water delivered within the parliamentary area during the half year (4246·127 million gallons), 297·273 million gallons—7 per cent. of the whole—was derived from local sources. Notwithstanding the interruptions in the Welsh supply, the demand was at all times met without restriction. The policy of retaining certain of the old sources of supply as auxiliaries to meet special demands—thus deferring the time when a third pipe on the aqueduct will be required—has been abundantly justified by the experience of the summer. Since the dismantling of the old re-pumping station in the Lichfield Road, the pumping power at the Short Heath well and the main capacity from the Aston wells have been insufficient to deal with the full yield of these wells. With a view to utilize these sources to the utmost when occasion requires it, the Committee have authorized the expenditure of certain sums on the stations.

The Committee submit a new scale of water charges for domestic purposes. It is pointed out that the present scale has been in operation since 1893. At that time, the poundage of the rates on which the net annual values of compound houses were calculated was 6s. 8d., and allowed a good margin for increase. In consequence, however, of the continued growth of the rates, the margin has largely disappeared; and, in view of the further recent rise, the net annual values shown at some points in the scale will no longer be correct. It is therefore necessary that the scale shall be revised. The Department will not derive any advantage from the new scale, as the increases in certain parts of it will scarcely cover the reductions in other parts. The new scale will come into operation from Lady-day next. The differentiation of rates in the various rating districts of the extended city makes it impracticable to provide a uniform valuation table for the whole district, linked up to a scale of weekly rents; and a separate valuation

THE WINTER'S TAIL.

JANUARY

FEBRUARY

MARCH

Lest you be tempted to imagine that the heating season is over, perhaps a reminder that the most severe portion of the winter is often in its tail will not be out of place.

It may be remembered that, in the record winter of 1895, January was well advanced before the severe cold set in, which lasted for over two months.

A few Fires, &c., in stock now may lighten your labours later on. The Holidays and Stocktaking are now over and we can despatch with promptitude.

THE "SYMMETRICAL."

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, Princes St., Oxford Circus, W.; 136, Renfield St., GLASGOW; 56, Broad St., BIRMINGHAM; 83, Old Market St., BRISTOL; 13, Whitworth St. West, MANCHESTER; 8, Exchange Place, Donegall St., BELFAST; 333, Queen St., MELBOURNE; and 12, Cunningham Lane, Pitt St., SYDNEY, N.S.W.

table showing the net annual values of compound houses at various weekly rentals in the several rating districts will be issued by the department.

A schedule appended to the report shows that, in the case of occupiers, the annual water-rents for domestic purposes range from 6s. on houses of a net annual value not exceeding £5, to £3 on houses whose net annual value exceeds £40 but does not exceed £50. After £50, the water-rent will be at the rate of 6 per cent. on the amount of the net annual value. In the case of retail shop premises at values exceeding £50, the water-rental will be governed to some extent by the nature of the supply; and provision is also made in the scale to meet the case of lock-up shops, offices, &c. For baths, the annual water-rent varies from 4s. on a house of a net annual value not exceeding £10, to 10s. where the net annual value exceeds £50. In the case of compound houses, the annual water-rents to landlords who agree to pay whether the houses are occupied or not range from 5s. 2d. where the net annual value of the house does not exceed £5, to £1 8s. where the net annual value exceeds £15 but does not exceed £17 10s.

PROPOSED EXPENDITURE ON WATER UNDERTAKINGS.

The following estimates have been prepared by the engineers in connection with the Bills coming before Parliament next session asking for authority to carry out works in respect of the supply of water:—

	Total.
Bawtry and Tickhill Gas and Water Company (Mr. E. J. Silcock)	£8,521
Dunbar Water (Mr. J. H. Warren)	19,430
Dunstable Gas and Water Company (Mr. A. F. Phillips)	7,000
Egremont Urban District Council (Mr. J. C. Boyd)	28,500
Fylde Water Board (Mr. T. Cook)	1,859,550
Glasgow Corporation (Mr. J. R. Sutherland)	246,500
Ivybridge Urban District Council (Mr. H. Francis)	8,100
Keighley Corporation (Mr. J. Watson and Mr. M. R. Barnett)	208,750
Llanelly District Council (Messrs. Rofe and Son)	179,423
Scunthorpe Urban District Council (Messrs. H. Rofe and Son, and Mr. C. Curtis Gray)	6,548
Sheffield Corporation	798,218
Staffordshire Potteries Water Company (Mr. G. B. H. Soame)	198,033
Swanage Gas and Water Company (Mr. E. M. Eaton)	51,578
Tendring Hundred Gas and Water Company (Mr. B. W. Bryan)	95,684
Windermere Gas and Water Company (Mr. J. E. Willcox)	7,750
Ystradfellte Water (Mr. E. P. Hill and Mr. D. M. Davies)	150,000

HOWDEN (YORKS.) RURAL DISTRICT WATER SUPPLY.

An Important Scheme in Preparation.

Situated on a low, flat marshy plain bounded by the River Ouse on the west and south, and the Yorkshire wolds on the east, the Howden rural district has been for many years in great difficulties as regards water supply. The population is small and widely distributed, amounting to only 12,625 over an area of 150 square miles; and the only town of any magnitude is Howden, with a population of 2000. A Company was formed in 1886 to supply water to the town and contiguous villages; but the only available source of supply was a boring into the new red sandstone, and the water obtained therefrom is hard and highly charged with iron. The result is that, though mains were laid in Howden, the water has never been supplied to the town, and is now only available in two small villages adjacent to the works. In the meantime, the Company went into liquidation, and the property was acquired by a local resident for a small sum.

The private wells upon which the inhabitants of the district rely nearly all yield water of doubtful quality; and pressure has been brought to bear upon the Rural District Council to provide a public supply—a prominent resident (recently deceased) going so far as to take action under the Public Health Act, 1875, to compel the Council to do so. This action has been actively supported by the East Yorkshire County Council; and in October last the Local Government Board held a local inquiry, at which the Rural District Council admitted default, but pleaded "excessive cost" in extenuation. Evidence was, however, given which showed the possibility of obtaining the supply required; and the vital question of "reasonable cost" was left over, on the Council undertaking to prepare a scheme. In accordance with this undertaking, the Council have recently engaged Mr. Percy Griffith, M.Inst.C.E., F.G.S., of Westminster, to advise them upon the matter; and we understand he is now engaged in preparing his report.

It appears that two alternative schemes have been proposed, apart from boring to the sandstone, the prospects of which are by no means encouraging—one being to take water in bulk from the Selby Urban District Council, who are fortunately in a position to offer a supply from their new works; and the other is to obtain a supply from springs thrown out at the base of the chalk escarpment at the eastern boundary of the district. Whatever scheme is ultimately adopted, the cost is bound to be large in proportion both to the population and the rateable value of the district—the estimates being from £50,000 to £60,000; and a general rate of considerable amount must of necessity result. We learn, however, that, in the interests of public health, the Council and the residents are prepared to make the necessary sacrifices; and it only remains for a practicable, and at the same time reasonable, scheme to be designed and carried out.

The Highworth Gas Company, Limited, has been registered with a capital of £1500, in £1 shares.

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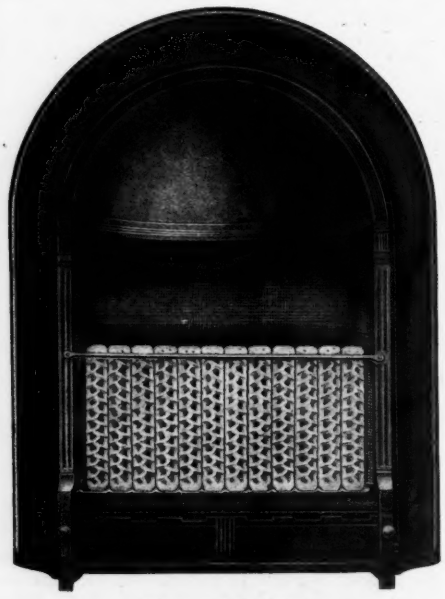

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The "Kalo" Gas Fire is similar in design to the "Olak" but is of square shape.

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The "OLAK."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The question of the appointment of Mr. W. B. M'Lusky as Gas Engineer and Manager to the Halifax Corporation, and his subsequent resignation of his post at Perth, was on Wednesday under the consideration of the Gas Committee of the Perth Town Council. After a somewhat protracted discussion, it was agreed to advertise the vacancy at a commencing salary of £350 per annum, rising by annual increments of £25 to £500.

The General Manager of the Glasgow Corporation Gas Department, under date of the 3rd inst., writes that some parties are calling on consumers in various districts of the city selling flat-flame burners, and representing that they are the agents of the Gas Department. As the department do not employ any agents, the public are warned against making purchases.

A number of the gas consumers in Glasgow are objecting to the Corporation supplying the public with gas-stoves free; and an agitation is being mooted to put a stop to the practice.

The municipal and other accounts of the City of Edinburgh for the year 1911 have been issued in a bulky volume of 500 pages; and among the mass of figures those relating to the Edinburgh and Leith Gas Commissioners' undertaking are not the least noteworthy or interesting, as showing the really wonderful development that has taken place within the past few years. The stock capital at May 15, 1911, stood at £894,566, which, with the exception of £24,000, is redeemable on the statutory terms at 28½ years' purchase; the smaller figure being redeemable at 20 years' purchase. Out of a total loan capital authorized of £1,400,000, the sum of £1,099,195 has been borrowed, on 3, 3¼, and 3½ per cent. mortgages; while by the Act of 1908 the Commissioners can borrow, in addition to this amount, any sum up to £800,000 for the purpose of redeeming, compulsorily or otherwise, the annuities granted in terms of the Act of 1888. The capital account represents £2,227,068, in which is included the cost of the Granton Gas-Works at £841,537. The total income amounted to £338,052, and the expenditure to £222,178; leaving a balance of £115,874 to be carried to the profit and loss account. After all the necessary charges, amounting to £110,126, were met, the sum of £5748 was carried forward to the next account. In 1890, the price of gas was 3s. 6d. per 1000 cubic feet to ordinary consumers; and in 1892 and 1893 it rose to 4s. 6d. It now stands at 2s. 10d. and 2s. 8d. (for power it is 2s. 6d. and 2s. 3d.) per 1000 cubic feet. The quantity of gas made has risen from 1,971,591,000 cubic feet in 1902 to 2,043,292,000 cubic feet as at May 15 last. In the same period, the number of ordinary consumers has risen from 77,764 to 81,760; while the number of gas workers has increased from 6051 to 8957. The average price of gas, after deduction of discounts, now stands at 2s. 7·99d. In other directions striking increases have to be noted; and from every standpoint the gas undertaking is one of the best assets the citizens have.

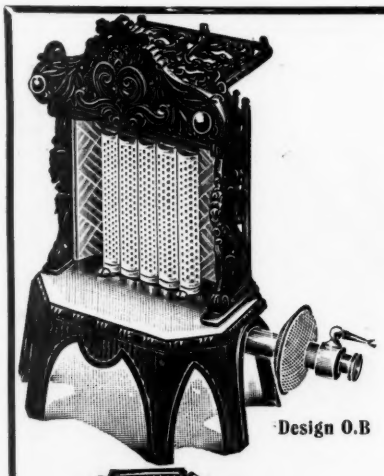
A proposal to increase the salary of Mr. A. C. Young, the Gas Manager at Arbroath, was discussed at a meeting of the Finance Committee of the Town Council on Thursday. Provost Alexander moved that an advance of £50 per annum be given, and in supporting the proposal he spoke in appreciative terms of Mr. Young's able management of the gas undertaking, and of his eminence as a gas engineer. Councillor G. R. Wallace, the Convener of the Gas Committee, seconded this; and, on a division, twelve members voted for the proposed increase, three were against granting it, and two declined to vote until the following Monday, when the matter would come before the Town Council for confirmation. Mr. Young's present salary is £300 per annum, with free house, fuel, and light.

The Gas Committee of the Dunfermline Town Council are to recommend to the Corporation that a bench of four vertical retorts should be erected at the gas-works, at a cost of £1200.

The employees of the Aberdeen Corporation Gas-Works last year contributed upwards of £32 to local charitable institutions; £14 being the allocation to the Royal Infirmary.

From the minutes of the Heriot Trust, Edinburgh, it transpires that the Secretary of the Edinburgh and Leith Operative Plumbers' Society wrote to the Principal of the Heriot-Watt College protesting against the admission to the plumbing classes of lads who are not connected with the plumbing trade. The Principal pointed out that this referred to a number of lads who were in the employment of the Edinburgh and Leith Gas Commissioners as gas-fitters, and who are required by them to attend the plumbing classes. The Plumbing Advisory Committee of the College, however, resolved to point out to the Governors that as the course of instruction in the College classes is primarily intended for the technical improvement of apprentice plumbers, it is not suitable for the Gas Commissioners' employees, and that the solution of the matter appeared to be that next session a separate class, dealing mainly with gas-fitting work, should be formed for these lads.

Mr. W. Wilson, the Gas Engineer and Manager to the Falkirk Corporation, points out two errors in the paragraphs relating to the borough in the "Notes from Scotland" last week. The net increase in the quantity of gas sent out from May 15 to Nov. 30 last was equal to 0·38 (not 38) per cent. as compared with the preceding year; and in the paragraph relating to the Provisional Order, the promoter's name should have been given as Mr. George Balfour (not Brown). In the reference to Mr. M'Lusky in the first paragraph of the "Notes," it was inadvertently stated that during his tenure of office in Perth he had completed an installation of inclined retorts, and was negotiating for the construction of some on the vertical system. We learn that this is not so; the retort-settings at Perth being horizontals, charged and discharged by West's machines.



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May we send you our NEW ILLUSTRATED CATALOGUE,

Together with a quantity of Booklets?

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Welsbach Upright Mantles (C, CX, & Plaissetty) & Welsbach Inverted Mantles, 4½d. each.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 6.

Sulphate of Ammonia.

Throughout the week the demand for this material has continued good, and no difficulty has been experienced in disposing of the present output at prices tending in the favour of sellers. The requirements have been largely for account of dealers with previous contracts to cover; but there have also been a fair number of new orders in the market from consumers both in this country and abroad. At the close, the nearest values are £14 5s. per ton f.o.b. Hull, £14 6s. 3d. per ton f.o.b. Liverpool, and £14 8s. 9d. per ton f.o.b. Leith. The premium required by manufacturers for future delivery has rather stood in the way of business; but it is reported that sales have been made at £14 10s. per ton f.o.b. Leith for January-April shipment, and at £14 7s. 6d. per ton f.o.b. Liverpool for January-June, in equal monthly quantities.

Nitrate of Soda.

Owing to fresh arrivals in Liverpool, the quotations on spot have been reduced to 10s. and 10s. 3d. per cwt. for ordinary and refined quality respectively.

LONDON, *Jan.* 8.

Tar Products.

The markets for tar products still remain firm. In pitch, the inquiry continues good, and prices remain decidedly firm. In some quarters, slightly better prices have been paid. Benzols are steady, although there is not a large volume of business doing. Solvent naphthas are in good demand, and fair quantities have been placed for delivery over the whole of the year. Heavy naphtha is also in good request. For creosote, there is a steady inquiry; and distillers are very firm in their ideas. Crude carbolic remains in about the same position.

The average values during the week were: **Tar**, 22s. 9d. to 26s. 9d. *ex* works. **Pitch, London**, 42s. to 42s. 6d.; **east coast**, 42s. to 42s. 6d.; **west coast, Clyde** 40s. 6d. to 41s. 6d., **Manchester** 40s. 6d. to 41s., **Liverpool** 41s. 6d. to 42s. **Benzol, 90 per cent.**, naked, London, 11d.; North, 10½d. to 10¾d.; **50-90 per cent.**, naked, London, 10d. to 10½d.; North, 9½d. **Toluol**, naked, London, 10d.; North, 8½d. to 9d. **Crude naphtha, in bulk, London**, 4½d. to 5d.; **North**, 3⅝d. to 4¼d. **Solvent naphtha**, naked, London, 10½d. to 11d. f.o.b.; North, 9½d. to 9¾d. f.o.b. **Heavy naphtha**, naked, London, 11½d. to 1s. 0¾d. f.o.b.; North, 10d. to 10½d. f.o.b. **Creosote, in bulk, London**, 2⅝d. to 3⅛d.; North, 2½d. to 2⅝d., salty; 2⅝d. to 2¾d., liquid. **Heavy oils, in bulk**, 3⅛d. to 3⅜d. **Carbolic acid**, casks included, **60 per cent., east coast**, 3s.; west coast, 3s. **Naphthalene**, £4 10s. to £10; salts, 40s. to 45s., bags included. **Anthracene**, "A" quality, 1½d. to 2d. per unit, packages included and delivered.

Sulphate of Ammonia.

There has been a little more inquiry during the past few days, which has hardened values at nearly all ports, and slightly better prices are reported in one or two cases. Actual Beckton is still quoted at £13 17s. 6d. Outside London makes are £13 10s.; Leith, £14 4s. to £14 7s. 6d.; Liverpool, £14 5s.; Hull, £14 3s. 9d. to £14 5s.; Middlesbrough, £14 3s. 9d. to £14 5s.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade of the North is now brisker after the holiday quiet has gone, and there is a good general demand for coal, with heavier shipments. In steam coals, best Northumbrians are from 11s. 9d. per ton f.o.b., second-class steams are from 10s. 9d. to 11s. 3d., and steam smalls from 5s. 6d. to 6s. 6d. The output appears now to be normal, and to be well taken up; while the labour agitation is inclining users to stock fuel. In the gas coal trade, there is still a very heavy demand, though the greatest pressure always seems to be past after the turn of the year. For Durham best gas coals, from 12s. 6d. per ton f.o.b. is the current price; second-class kinds are from 11s. 6d. to 11s. 9d.; and "Wear specials" are about 13s. to 13s. 3d. There are one or two small contracts in the market; but the doubtful labour outlook and the high rates of freight hinder the completion of some of these, and there is no doubt that where contracts run for some time it may be prudent to wait for a settlement. In coke, there is a steady market. Good gas coke may now be quoted at about 15s. to 15s. 3d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

The ballot of the miners over the minimum wage question has had a tendency to unsettle matters. Prices are normal; and no advance is reported over those of last week. There is a steady demand for export; and the indications are that this will be a strong feature in the market. The annual circular by Messrs. D. M. Stevenson and Co., of Glasgow, states that the total exports of coal from Scotland in 1911 were 10,382,311 tons. On Saturday last, 37 steamers were loading coal for export at the various Scottish ports.

Oldham and Electric Cookers.—Some discussion has taken place in the Oldham Corporation Electricity Committee on the subject of experimenting with electric cookers. Mr. Newington said, in reply to a question, that he should suggest that persons who would use the cookers for the experiments be allowed the stoves free for two or three months, and that they be given free energy. It would be a bother to the consumers, because the Electricity Department would want their inspectors to go and test the appliances from time to time. He had no doubt he could get one or two makers to lend cookers for the experiments. On the proposition of Mr. Frith, the matter was left for the Chairman (Mr. C. Hardman) and Mr. Newington to settle, with power to make the experiment.

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The Most Practical and Scientific Fires Made.

Standardized and Interchangeable Parts.

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THE "SPARTAN."
One of the P.S.C. Series—The Popular Priced Fires.

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BIRMINGHAM & LONDON.

Dewsbury Gas Charges.

When a resolution was moved in the Dewsbury Town Council that application be made to the Local Government Board for the issue of a Provisional Order to empower the Corporation to deal with trade refuse, and to enable them to borrow additional money for the purposes of the gas undertaking, Mr. Myers moved an amendment that the clauses relating to the gas undertaking should be referred back to the General Purposes Committee. He said that Dewsbury had for years been charging a very high price for gas—indeed, he had the prices charged by a hundred similar bodies in England, and in only one case was it as high as in Dewsbury. The gas undertaking was a very profitable one; about 1s. in the pound being extracted from the profits towards the relief of the rates. He thought that when renewals required to be executed, they should have sufficient money in hand without applying to the Local Government Board for borrowing powers. Mr. Newsome seconded the amendment. It was explained that the clauses in the Draft Order had been inserted on the advice of their Parliamentary Agents, and that they were the usual clauses in connection with such an application. The amendment was defeated by a large majority.

Extended Area of the Barnard Castle Gas Company.

The extension of the gas supply by this Company to the villages of Lartington and Cotherstone was successfully inaugurated on Friday, the 29th ult. The compressing plant was started at the works at midday by Miss Wood, the daughter of the Secretary (Mr. Robert Wood); and in the afternoon the Directors, with the Secretary and the Manager (Mr. Oliver Sissons), were met at Cotherstone by the members of the Parish Council, whose Chairman (Mr. Dent), at the request of Mr. W. J. Watson (the Vice-Chairman of the Directors), adjusted the governors for the supply. The company subsequently assembled at the Temperance Hall, Cotherstone, where Mrs. Dent turned on and lighted the gas, which brilliantly illuminated the hall. Mr. Watson congratulated the Parish Council on the successful inauguration of gas lighting. Mr. Dent replied, and expressed his pleasure at the achievement of his hopes. Mr. H. C. Watson complimented the Contractors (Messrs. Brown and Kincaid, of Glasgow); and Mr. Henderson Kincaid replied on behalf of his own firm, and the Bryan Donkin Company, Limited, of Chesterfield, who supplied the twin compressing plant and engine and two sets of local pressure-governors. The main is composed of 3-inch Mannesmann steel tubes, delivering gas at high pressure, which is reduced locally by means of governors to the ordinary district pressure.

British Coalite Company, Limited.—The annual meeting of this Company has recently been held in London. Mr. H. Clarke, who presided, said that, unfortunately, the Auditors had not been able to complete their audit of the accounts within the time necessary for presentation at the meeting, so that the Directors had been obliged to call the meeting *pro formâ*, and propose an adjournment till the 25th inst. The accounts would then be presented, and the Directors would be able to explain the present position of the undertaking, and, he believed, show the shareholders in what way the Company could be rehabilitated. The operations since last July had been carried on at the Barking works, and, from a manufacturing point of view, had been satisfactory. The meeting was adjourned until the date named.

Blackpool Corporation and Labourers' Wages.—At the January meeting of the Blackpool Town Council, a discussion took place on a proposition put forward by Mr. Cartledge to the effect that, in contracts where the provision of labour is concerned, a condition be inserted requiring the contractors to pay all labourers of 21 years of age and upwards wages at the minimum rate of 6d. an hour. It was argued that, as the cost of living was now greater than formerly, and the different departments of the Corporation had adopted the minimum scale of 6d. an hour for labourers, it was only fair that contractors should be put under the same obligation. Alderman Grime and other members of the Council, while in favour of the motion, expressed the opinion that it required further consideration. It was eventually resolved to refer the matter to the General Purposes Committee.

Fatal Gas Explosion at Birmingham.—The Birmingham City Coroner held an inquiry last Thursday concerning the death of Elizabeth Wallace, a domestic in the employ of Mr. Walter Chance, of Edgbaston, who died from burns following a gas explosion on Tuesday. The evidence showed that deceased found a weight had fallen from a chandelier in one of the rooms, and there was an escape of gas. After going into the cellar and turning off the gas supply, she lit a candle and returned to the room, apparently with an idea of re-fixing the weight in position. An explosion followed; and when assistance arrived, Wallace was lying on the floor in flames from head to foot. She died the next morning in the hospital from shock following burns—the doctor stating that the only part of her not burned were her feet. A verdict of "Accidental death" was returned.

Water Charges at Hyde.—The Hyde Corporation having applied to the Local Government Board for power to vary the scale of charges for water, Mr. R. C. Maxwell, one of the Board's Inspectors, held an inquiry last Wednesday at the Hyde Town Hall in regard to the matter. It was explained by the Town Clerk that the Corporation obtained from the Manchester Corporation their water for domestic consumption. The deficiency for the present financial year on the water account was £666; and it was estimated that next year it would be £993. It was proposed to increase the charges by 25 per cent., so as to clear off the deficiency. Mr. D. H. Shaw, the President of the Ratepayers' Association, objected to the proposed increase, which he argued was not necessary. There had been much water wasted in consequence of the disturbance in the pipes, and this loss could be avoided, and an advance in the charges rendered unnecessary. The speaker pointed out that the rates of the town now totalled 8s. 1d. in the pound, and the water-rate was 1s. already, so that the proposed increase would bring up the rates and water-rent to 9s. 4d.

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SHOW-ROOMS:—LONDON (City)—15, Upper Thames Street, E.C.; (West End)—23, Princes Street, Cavendish Square, W.; 3, Berners Street, W.; LIVERPOOL—22-30, Redcross Street; MANCHESTER—24, Brazennose Street; GLASGOW—125, Buchanan Street; EDINBURGH—114, George Street; BRISTOL—6, Victoria Street; NEWCASTLE-ON-TYNE—13, Prudhoe Street; BIRMINGHAM—218, 220, 222, Corporation Street; DUBLIN—44, Grafton Street.

Rochford and District Water Supply.—Some time ago, the Rochford Rural District Council applied to the Local Government Board for sanction to the raising of a loan of £10,900 for the purposes of a new water supply; the intention being to sink a well at South Benfleet. These proposals met with considerable opposition from the six parishes affected—viz., Rayleigh, Hadleigh, Rochford, South Benfleet, Hockley, and Hawkwell; and the Board have declined to grant the loan. They consider that if the existing pumps were maintained in proper working order, the present supply would be sufficient to meet the requirements of the district for many years without constructing any additional works.

A Welsbach Catalogue.—We have received from the Welsbach Light Company, of Gray's Inn Road, W.C., the catalogue they have recently issued of their Welsbach-Kern gas-radiators. They are shown in great variety, occupying nearly 40 large pages; and they are submitted with every confidence, not only for their artistic design, but because they are of British make. Included in the catalogue is a reprint of an article from the "Lancet" on these radiators, giving the results of tests; and the rest of the book is occupied with particulars of the Welsbach cookers, samples of the various colours of ceramic porcelain enamels used on the radiators, and gas-rings, grillers, and the "Aur" mantles.

Village Water Supply.—The Romney Marsh Rural District Council at their last meeting received a report from the Medical Officer of Health on the water supply of Dymchurch—a favourite holiday village midway between Hythe and the Littlestone golf links. The report stated: "The Council have done absolutely nothing to provide a good water supply, though they know that most of the houses have no such supply, and that the normal population of 500 is about doubled during the holiday season. There is only one semi-public well, of doubtful quality. One well in general use the Council have already condemned. If you continue to allow these matters to drift, you will be confronted with a serious outbreak of disease sooner or later, and Dymchurch as a holiday resort will be extinct."

Gas-Engine Fatality at Liverpool.—An inquest was held last Friday at Liverpool on the body of Samuel Part, an engineer in the employ of Messrs. Lewis, who was fatally injured on Tuesday evening by a gas-engine explosion. It appeared that deceased was in charge of the engine, which was working satisfactorily until about 5.30 p.m., when it seemed to be racing, and a grinding and knocking sound was heard. While the deceased was taking the number of revolutions just at this time, there was a crash, and immediately afterwards the crank, piston-rod, and piston flew into the air. Part succumbed the following morning to his injuries, and another man also was hurt. Mr. Davies, a consulting engineer, said that in his opinion certain metal was defective. The engine had been quite recently overhauled. In returning a verdict of "Accidental death," the Jury expressed the view that the occurrence had been brought about by a fault existing in the bearings of the engine.

Water-Divining Experiences at Haslingden.—In the course of a Local Government Board inquiry at Haslingden last Wednesday, the Borough Surveyor (Mr. J. S. Green) stated that he knew the Board did not give much credence to water diviners; but in Haslingden repeated experience justified the Corporation in having engaged one. A considerable number of firms in the town had for years been obtaining large supplies of water which were indicated by diviners, and which showed no diminution. The Town Council, following the advice of one of them, sank a borehole and laid a pump within the grounds of the municipal offices, in order to obtain a supply of water for the destructor; but unfortunately it gave out in six months. The diviner's view was that the reserve tapped was an overflow from some other underground basin. He indicated water on other land held by the Corporation; and from it they had for nine months raised upwards of 49,000 gallons a week without tracing diminution. So that it looked as though they had tapped a never-failing source. The cost of supplying the refuse destructor from it was £52 a year; whereas an equal supply from the mains of the Bnry and District Water Board would cost £108.

GAS COMPANIES' STOCK AND SHARE LIST.

The opening week of 1912 has been for the Stock Exchange a quiet one, and almost devoid of any interesting or exciting feature. That it was shorn of one day was an element against it. The tone for the most part was irregular and uncertain; and the tendency swayed up and down, but was never strong. Recent favourites in the Miscellaneous Market attracted most attention. On the re-opening on Tuesday, markets were slow in getting to work, and there were still a good many absentees; but the tone generally was fair. Government and other gilt-edged issues were firm; Rails were hopeful and made some small advances; Americans came out stronger; and Foreign were pretty good. Business livened up a bit on Wednesday, and the tendency was favourable. The gilt-edged division again were strong, and Consols had a rise. Rails, after some hesitation, improved, and Americans advanced. The pendulum swung the other way on Thursday; and business was quiet and dull. Consols and other high-class issues were weaker; Rails were unsupported and fell back; and in most leading lines there was a drop. Friday was more active, but movements were uneven. Gilt-edged were mostly strong; but Consols fell ¼. Rails were dull at first, but strengthened later on hopeful labour rumours; and Americans were shifty. Saturday was quiet and dullish, but with no fall of any magnitude. Consols closed unchanged at 77 to 77¼. In the Money Market, with the turn of the year came great relaxation of stringency. The supply was ample, and rates both for short loans and for discount were light. Business in the Gas Market was quite brisk; and one or two favourite issues which had been slumbering for some time awoke to activity. The general tendency was strong and firm, though but few issues actually advanced their quotations. In Gaslight and Coke, the ordinary was active and advancing. Opening at 105, it rose steadily until it changed hands several times at 106—a rise of ¼. In the secured issues, the maximum was done at 85 to 86¼, the preference at 102½ to 104, and the debenture at 79¼. South Metropolitan was unusually active, and was very firm, changing hands at 116 to 117. In Commercials, there were two or three bargains in the 4 per cent. at 110⅛ to 111½. Among the Suburban and Provincial group, Alliance and Dublin was marked at 79½ and 80, Brentford old at 259, ditto new at 201 and 202, Bromley "C" at 119½, and South Suburban at 121 free. On the local Exchange, Liverpool "B" realized 163¾. In the Continental companies, there was very little business done. Imperial showed strength at 191½ to 192 (a rise of ½), ditto debenture marked 91, Union preference was done at 133⅜, and Tuscan at 8½. Among the undertakings of the remoter world, Bombay changed hands at 6¼, Cape Town preference at 4⅜, ditto debenture at 76, Monte Video at 12½, Primitiva at 7½ to 7 13/16, ditto preference at 5¼ and 5 5/16, and ditto debenture at 98 and 99.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 12	5	Alliance & Dublin Ord.	79—82	..	6 1 11
374,000	Stk.	July 14	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
250,000	5	Sept. 28	7	Bombay, Ltd.	6—6½	..	5 7 8
50,000	10	Aug. 31	15	Bourne-mouth Gas and Water	10 p.c.	..	5 0 0
311,810	10	"	7		B 7 p.c.	..	4 3 7
75,000	10	"	6		Pref. 6 p.c.	..	4 1 4
330,000	Stk.	Aug. 16	13	Brentford Consolidated	256—261	..	4 19 7
330,000	"	"	10	Do. New	198—203	..	4 18 6
50,000	"	"	5	Do. 5 p.c. Pref.	120—122	..	4 2 0
206,250	"	Dec. 14	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
220,000	Stk.	Aug. 31	11	Brighton & Hove Orig.	217—222	..	4 19 1
246,320	"	"	8	Do. A Ord. Stk.	156—159	..	5 0 8
490,000	20	Sept. 28	12½	British	44½—45½	..	5 9 11
120,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb. Stk.	92—94*	..	4 5 1
109,000	"	Aug. 16	6	Bromley, A 5 p.c.	127—132	..	4 10 11
165,700	"	"	4½	Do. B 3½ p.c.	97—102	..	4 8 3
82,278	"	"	5½	Do. C 5 p.c.	117—122	..	4 10 2
55,000	"	Dec. 29	3½	Do. 3½ p.c. Deb.	80—82*	..	4 5 4
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	94—96*	..	4 3 4
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	4¼—5½	..	—
100,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	76—80*	−1½	5 12 6
157,150	Stk.	Aug. 16	5	Chester 5 p.c. Ord.	111—113	..	4 8 6
1,513,380	Stk.	"	5/9/4	Commercial 4 p.c. Stk.	110—112	..	4 17 7
560,000	"	"	5½	Do. 3½ p.c. do.	105—107	..	4 19 8
475,000	"	Dec. 14	3	Do. 3 p.c. Deb. Stk.	75—77	..	3 17 11
800,000	Stk.	"	4	Continental Union, Ltd.	85—89	..	4 9 11
200,000	"	"	7	Do. 7 p.c. Pref.	132—134	..	5 4 6
492,270	Stk.	—	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	"	—	4	Do. Deb. Stk.	104—105	..	3 16 2
840,150	10	July 28	10	European, Ltd.	20—21	..	4 15 3
16,160,600	Stk.	Aug. 16	4/14/8	Gaslight and Coke	4 p.c. Ord.	105—106	+¼	4 9 3
2,600,000	"	"	3½		3½ p.c. max.	84½—86½	..	4 0 11
4,062,235	"	"	4		4 p.c. Con. Pref.	102—104	..	3 16 11
4,531,705	"	Dec. 14	3	Coke	3 p.c. Con. Deb.	79—81	..	3 14 1
258,740	Stk.	Sept. 14	5	Hastings & St. L. 3½ p.c. Do. do. 5 p.c.		94—96	..	5 4 2
82,500	"	"	6½			—	..	—
70,000	10	Oct. 12	11	Hongkong & China, Ltd.		17—17½	..	6 5 9
131,000	Stk.	Sept. 14	7½	Ilford A and C		154—157	..	4 15 6
65,780	"	"	6	Do. B		125—128	..	4 13 9
65,500	"	Dec. 29	4	Do. 4 p.c. Deb.		92—94*	..	4 5 1
4,940,000	Stk.	Nov. 10	9	Imperial Continental		191—193	+½	4 13 3
1,235,000	Stk.	Aug. 16	3½	Do. 3½ p.c. Deb. Red.		90—92	..	3 16 1
200,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.		125—130	..	4 12 4
561,000	Stk.	Aug. 16	10	Liverpool United A.		219—221	..	4 10 6
718,100	"	"	7	Do. B.		163—165	..	4 4 10
306,083	"	Dec. 29	4	Do. Deb. Stk.		100—102*	..	3 18 5
75,000	5	Dec. 14	6	Malta & Mediterranean		4¼—5	..	6 0 0
560,000	100	Oct. 2	5	Met. of Melbourne	5 p.c. Deb.	100—102	..	4 18 0
250,000	100	"	4½		4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 10	3½	Monte Video, Ltd.		12—12½	..	5 12 0
1,775,892	Stk.	July 28	4⅜	Newc'tle&G'tesh'd Con.		101½—102	..	4 5 9
529,705	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.		85—87*	..	4 0 6
55,940	10	Aug. 31	7/7/0	North Middlesex 7 p.c.		14½—15½	..	4 14 10
300,000	Stk.	Dec. 14	8	Oriental, Ltd.		134—136	..	5 17 8
60,000	5	Sept. 28	8	Ottoman, Ltd.		6⅞—7⅛	..	5 10 4
31,800	53	Aug. 16	13	Portsea Island A		140—145	..	4 14 10
60,000	50	"	13	Do. B		133—138	..	4 14 2
100,000	50	"	12	Do. C		130—135	..	4 8 11
398,490	5	Oct. 12	8	Primitiva Ord.		7⅜—7⅞	..	5 4 11
796,980	5	Dec. 29	5	Do. 5 p.c. Pref.		5 5/16—5 5/8*	..	4 14 1
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.		97—99	..	4 0 10
312,650	Stk.	Dec. 29	4	River Plate 4 p.c. Deb.		94—96*	..	4 3 4
250,000	5	Sept. 28	12	San Paulo, Ltd.		10½—11	..	5 9 1
115,000	10	"	6	Do. 7 p.c. Pref.		11⅝—12	..	5 0 0
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.		49—50*	..	5 0 0
135,000	Stk.	Aug. 31	10	Sheffield A		239—241	..	4 3 0
209,984	"	"	10	Do. B		239—241	..	4 3 0
523,500	"	"	10	Do. C		239—241	..	4 3 0
90,000	10	Sept. 28	6	South African		8—9	..	6 13 4
6,429,895	Stk.	Aug. 16	5/9/4	South Met., 4 p.c. Ord.		116—118	..	4 12 8
1,895,445	"	July 14	3	Do. 3 p.c. Deb.		79—81	..	3 14 1
209,820	Stk.	Aug. 16	8½	South Shields Con. Stk.		157—159	..	5 6 11
605,000	Stk.	"	5¾	S'th Suburb'n Ord. 5 p.c.		121—123	..	4 12 0
60,000	"	"	5	Do. 5 p.c. Pref.		117—120	..	4 3 4
117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.		121—123	..	4 1 4
502,310	Stk.	Nov. 10	5	Southampton Ord.		107—109	..	4 11 9
120,000	Stk.	Aug. 16	7½	Tottenham and Wands-worth	A 5 p.c.	145—148	..	4 16 3
483,940	"	"	5⅝		B 3½ p.c.	115—117	..	4 16 1
149,470	"	Dec. 29	4	Edmonton	4 p.c. Deb.	94—96*	..	4 3 4
182,380	10	"	5	Tuscan, Ltd.		8½—9*	..	5 11 1
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.		97—99*	+½	5 1 0
236,476	Stk.	Aug. 16	5	Tynemouth, 5 p.c. max.		114—116	..	4 6 2
255,636	Stk.	Aug. 31	6⅞	Wands-worth	B 3½ p.c.	142—145	..	4 14 10
85,766	"	Dec. 29	3		3 p.c. Deb. Stk.	71½—73½*	..	4 1 8

Prices marked * are "Ex. div."

The Portsea Island Gas Company have consented to the wishes of the Portsmouth Town Council to establish in the borough four testing-stations instead of only one.

The Vertical Gas-Retort Syndicate report that they have received a repeat order from the Auckland (N.Z.) Gas Company. The installation is to be erected at the Auckland works of the Company, and will comprise seven beds of eighteen 4-metre Dessau retorts—making 126 retorts in all.

A recent failure of the gas supply at Barnoldswick gave rise to a long discussion in the Urban District Council last Wednesday. It was opened by Mr. T. Edmondson; and it elicited the statement by the Gas Engineer and Manager (Mr. J. W. Thompson) that the condensing and exhausting plant was not acting properly. He said the exhauster ran at the rate of 40 to 45 revolutions per minute; but unless someone stood beside it the engine slowed down, and then the trouble commenced. He had done all he possibly could to remove the defect; and now that the plant was running in the ordinary way, coupled with another bye-pass, he had no reason to fear that it would not continue to do so. They were gaining every day; and by the end of the week the holders should be full. It appeared that Mr. Thompson had not consulted the Gas Committee in the circumstances. He admitted that this was a mistake on his part; but he explained that each day he felt he might be able to overcome the difficulty. He added that it pressed upon him so heavily that he had for a fortnight been deprived of proper sleep. During the the previous three weeks the foreman had worked extremely hard; and he was pleased to say that all the men had done their best in the emergency. The matter then dropped.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending Jan. 6. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.	
					Liverpool.	Manchester.
Tar, crude	per ton	—	22/6 27/-	23/- 27/-	—	24/- 27/6
Pitch	„	42/6	42/3	42/6	40/6	40/6
Benzol, 90%	per gallon	1/2½	1/0½	1/-	1/-	-/11¾
Benzol, 50-90%	„	—	-/11½	-/11	-/11	-/11
Toluol, 90%	„	—	-/11	-/11	—	-/10¼
Crude naphtha, 30%	„	—	-/5	-/4½	-/5	-/4⅝
Light oil, 50%	„	—	-/4¾	—	-/4¾	-/4¾
Solvent naphtha, 90-160	„	—	-/11⅜	-/10½	—	-/10⅜
Heavy naphtha, 90-190	„	—	-/11	-/11	—	-/11¼
Creosote in bulk	„	-/3⅛	-/2⅝	-/2 9/16	-/2⅝	-/2⅝
Heavy oils	„	—	-/2¾	-/2¼	—	-/2¼
Carbolic acid, 60's	„	—	3/1½	3/-	—	—
Naphthalene, crude drained salts	per ton	—	45/-	42/6	47/6	50/-
„ pressed	„	—	65/-	63/-	60/-	60/- 75/-
„ whizzed	„	—	—	—	71/3	65/- 75/-
Anthracene	per unit	-/2	-/1½	-/1½	-/1¼	-/1¼

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

ENGINEER AND MANAGER. Perth Gas Department. Applications by Jan. 15.

MANAGER (Argentine Republic). No. 5502.

LABORATORY ASSISTANT. No. 5507.

GAS INSPECTOR. Portsea Island Gaslight Company. Applications by Jan. 15.

MAINTENANCE INSPECTOR. Radcliffe Gas Company.

GENERAL WORKS FOREMAN. Batley Gas Department. Applications by Jan. 16.

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REPRESENTATIVE. Parkinson Stove Company, Birmingham.

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